

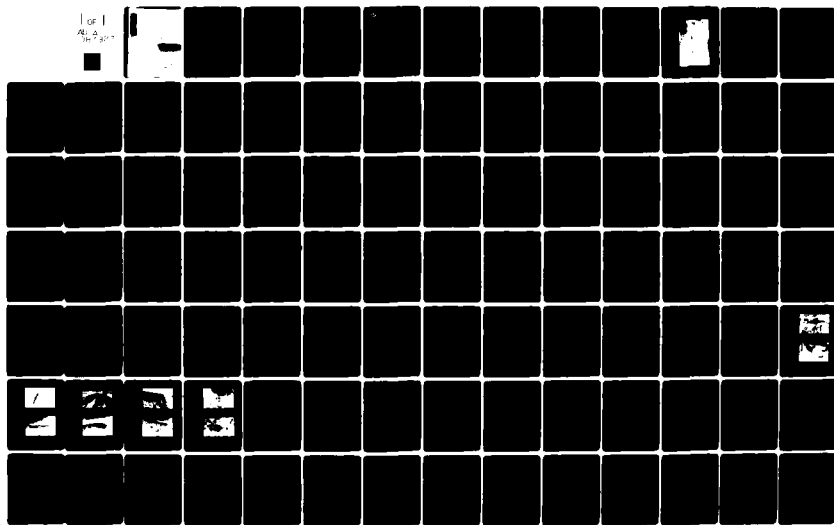
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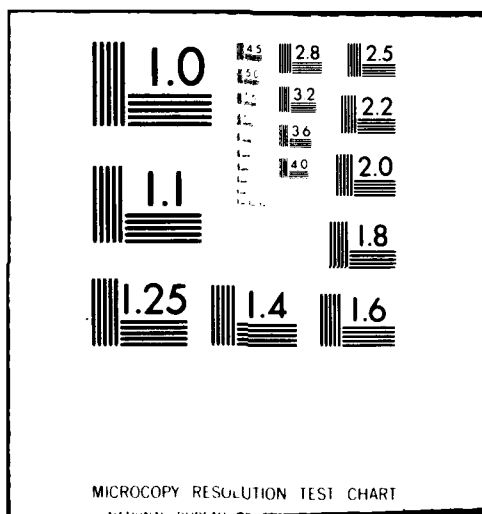
NEW JERSEY DEPT OF ENVIRONMENTAL PROTECTION TRENTON F/G 13/13
NATIONAL DAM SAFETY PROGRAM. STONY BROOK WATERSHED DAM SITE NUM--ETC(U)
FEB 80 R J MCDERMOTT DACW61-79-C-0011

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17. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.		

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24 JUL 1980

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Stony Brook No. 7 Dam in Mercer County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Stony Brook Dam No. 7, a high hazard potential structure is judged to be in good overall condition and the spillway is considered adequate. To ensure adequacy of the structure, the following remedial actions are recommended:

a. Within six months from the date of approval of this report the following remedial actions should be initiated:

(1) A riprap splash pad and slope protection should be installed at the discharge culvert outlet to stabilize the scoured streambed and adjacent embankment toe.

(2) Arrangements should be made to monitor the two areas of seepage at the toe of the dam on a monthly basis in order to detect any changes in its condition.

(3) The owner should develop an emergency action plan together with an effective warning system outlining actions to be taken by the operator to minimize downstream effects of an emergency at the dam.

b. Within one year from the date of approval of this report the owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

c. Annually check the rate of flow and transport of fine sediment at the noted wet areas.

NAPEN-N


Honorable Brendan T. Byrne

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Courter of the Thirteenth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Inspection Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,



JAMES G. TON
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

Copies furnished:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
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STONY BROOK DAM NO. 7 (NJ00344)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 16 November and 28 November 1979 by Storch Engineers under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Stony Brook Dam No. 7, a high hazard potential structure is judged to be in good overall condition and the spillway is considered adequate. To ensure adequacy of the structure, the following remedial actions are recommended:

a. Within six months from the date of approval of this report, the following remedial actions should be initiated:

(1) A riprap splash pad and slope protection should be installed at the discharge culvert outlet to stabilize the scoured streambed and adjacent embankment toe.

(2) Arrangements should be made to monitor the two areas of seepage at the toe of the dam on a monthly basis in order to detect any changes in its condition.

(3) The owner should develop an emergency action plan together with an effective warning system outlining actions to be taken by the operator to minimize downstream effects of an emergency at the dam.

b. Within one year from the date of approval of this report the owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

c. Annually check the rate of flow and transport of fine sediment at the noted wet areas.

APPROVED:

James G. Ton
JAMES G. TON

Colonel, Corps of Engineers
District Engineer

DATE:

1 Dec 1980

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Stony Brook Watershed Dam Site No. 7, NJ00344
State Located: New Jersey
County Located: Mercer
Drainage Basin: Raritan River
Stream: Stony Brook
Date of Inspections: November 16, 1979
November 28, 1979

Assessment of General Condition of Dam

Based on available records, past operational performance, a visual inspection and Phase I engineering analysis, Stony Brook Watershed Dam Site No. 7 is assessed as being in good overall condition.

The spillway is capable of passing the designated spillway design flood (one-half the probable maximum flood) without an overtopping of the dam and, therefore, is assessed as being adequate.

It is recommended that a riprap splash pad and slope protection at the discharge culvert outlet be installed in the near future to stabilize the scoured streambed and adjacent embankment toe.

Two areas of seepage were observed at the toe of dam. Arrangements should be made in the near future to monitor the seepage on a monthly basis in order to detect any changes in its condition. The monitoring should be performed by a professional engineer experienced in the design and construction of dams.

The owner should, in the near future, develop an emergency action plan together with an effective warning system outlining actions to be taken by the operator to minimize downstream effects of an emergency at the dam.

The present program of annual inspection and maintenance performed by the owner at the dam site should be continued. Two additional items should be checked annually:

- 1) operational adequacy of the outlet works.
- 2) rate of flow and transport of fine sediment at the noted wet areas.

In the near future, the owner of the dam should develop written operating procedures and a periodic maintenance plan to insure the safety of the dam.


Richard J. McDermott, P.E.


John E. Gribbin, P.E.



OVERVIEW - STONY BROOK WATERSHED SITE NO. 7 DAM

29 NOVEMBER 1979

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 30214. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that the unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

STONY BROOK WATERSHED DAM SITE NO. 7
I.D. NJ00344

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority

Public Law 92-367, August 8, 1972 authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The Division of Water Resources of the New Jersey Department of Environmental Protection (NJDEP) in cooperation with the Philadelphia District of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the State of New Jersey. Storch Engineers has been retained by the NJDEP to inspect and report on a selected group of these dams. The NJDEP is under agreement with the Philadelphia District of the Corps of Engineers.

b. Purpose of Inspection

The visual inspections of Stony Brook Watershed Dam Site No. 7 were performed on November 16 and 28, 1979. The purpose of the inspections was to make a general assessment of the structural integrity and operational adequacy of the dam structure and its appurtenances.

1.2 Description of Project

a. Description of Dam and Appurtenances

The facilities at Stony Brook Watershed Dam Site No. 7 consist of a zoned earthfill embankment with two uncontrolled spillways and one outlet works.

The earthfill embankment is approximately 650 feet long and extends approximately northwest/southeast. The embankment crest is about 12 feet wide covered with a dense stand of grass. The downstream embankment slope is 2.5 horizontal to 1 vertical. The upstream face of the embankment has a compound slope generally consisting of 2.5 horizontal to 1 vertical from the crest at elevation 224.2 national geodetic vertical datum (N.G.V.D.) to the embankment toe with a flatter berm area 8 feet wide between elevations 215.0 and 216.5 (normal pool water level). Both the downstream slope and the exposed portion of the upstream slope are covered with dense grass.

The principal spillway consists of a rectangular reinforced concrete riser with inside dimensions of 4 feet by 7 feet. The riser is topped with a reinforced concrete slab 15.67 feet by 8.5 feet. There are two openings between the riser and the top slab, each measuring 7 feet horizontally by 2 feet vertically, yielding a total spillway crest length of 14 feet. The spillway crest elevation is 216.0, about 8.2 feet below the embankment crest.

The riser top slab overhangs the spillway openings by 5 feet on each side with vertical side panels that taper from the riser to edges of the slab. The slab and side panels serve as an anti-vortex device and also provide for the mounting of horizontal pipes serving as trash racks.

The concrete riser is approximately 16 feet high and is founded on a reinforced concrete slab 18 inches thick. The riser invert is set at elevation 200.0.

The principal spillway discharges through a reinforced concrete pressure pipe 48 inches in diameter which extends through the embankment. The discharge culvert inverts at the riser and the outlet are elevations 200.0 and 199.62, respectively. The pipe outfalls into a small scoured pond at the head of a natural stream which extends under N.J. Route 31 and joins Stony Brook.

The outlet works consists of a slide gate controlled corrugated metal pipe 12 inches in diameter. The inlet pipe is connected to a vertical corrugated metal half-round section 48 inches in diameter which is bolted to the upstream face of the riser. The slide gate is mounted at the bottom of the riser inside the half-round section. The outlet pipe is approximately level with its invert at elevation 200.0 and extends from the riser to the upstream toe of the embankment.

The auxiliary spillway is located at the southeast end of the embankment. The spillway consists of a grassed trapezoidal channel 75 feet wide with side slopes of 1 vertical to 3 horizontal. The inlet channel is about 200 feet long and slopes up to the spillway crest at 2 percent. The spillway crest consists of a level section 20 feet across at elevation 220.6. The outlet channel is approximately 300 feet long and slopes down at about 3 percent. The outlet channel discharges into a natural stream which joins the stream extending from the principal spillway discharge and passes under N.J. Route 31 where it converges with Stony Brook.

b. Location

Stony Brook Watershed Dam Site No. 7 is located at the northeast end of the impounded sediment retention pond. The dam and impoundment are in the Township of Hopewell, Mercer County, approximately 200 feet south of N.J. Route 31. Discharge from the spillways enters Stony Brook a tributary of the Millstone River in the Raritan River Basin. The dam and impoundment are located on two privately owned parcels.

c. Size and Hazard Classification

Size and Hazard Classification criteria presented in "Recommended Guidelines for Safety Inspection of Dams," published by the U.S. Army Corps of Engineers are as follows:

SIZE CLASSIFICATION

	<u>Impoundment</u>	
	<u>Storage (Ac-ft)</u>	<u>Height (Ft.)</u>
Small	< 1000 and ≥ 50	< 40 and ≥ 25
Intermediate	≥ 1000 and $< 50,000$	≥ 40 and < 100
Large	$\geq 50,000$	≥ 100

HAZARD POTENTIAL CLASSIFICATION

<u>Category</u>	<u>Loss of Life</u> (Extent of Development)	<u>Economic Loss</u> (Extent of Development)
Low	None expected (no permanent structures for human habitation)	Minimal (Undeveloped to occasional structures or agriculture)
Significant	Few (No urban developments and no more than a small number of inhabitable structures)	Appreciable (Notable agriculture, industry or structures)
High	More than a small number	Excessive (Extensive community, industry or agriculture)

The characteristics of the dam and impoundment at Stony Brook Watershed Dam Site No. 7 are:

Storage: 111 acre-feet

Height: 27.8 feet

Potential Loss of Life

Residential dwelling approximately 500 feet downstream from the dam within the dam breach flood plain.

Also heavily travelled highway (Route 31) approximately 200 feet downstream from dam.

Potential Economic Loss:

Route 31 bridge approximately 200 feet downstream from the dam. This bridge would be overtopped and probably washed out, if the dam were breached.

Therefore, the dam at Stony Brook Watershed Dam Site No. 7 is classified as "Small" size and "High" hazard potential.

d. Ownership

The dam and impoundment are located on private property. Easement agreements between the property owners and the Freehold Soil Conservation District are in the NJDEP file. The easement "take-line" was established by the S.C.D. as all lands below elevation 222.4.

The dam and 3.9 acres of the impoundment below elevation 222.4 are located on a privately owned parcel held by the Hunt family as indicated on the easement records. The

remaining 7.6 acres of the impoundment area below elevation 222.4 is part of a privately owned parcel held by the Gauss family as indicated on the easement records.

Operation and maintenance of the impoundment, dam and appurtenances is the responsibility of the Stony Brook Millstone Watershed Association, Hopewell, New Jersey.

e. Purpose of Dam

Stony Brook Watershed Dam No. 7 impounds a small lake, formerly known as Hunt Lake, which presently serves the purposes of sediment retention and irrigation water supply.

These purposes are consistent with the "Application for Permit for Construction and Repair of Dam" filed on March 16, 1959.

f. Design and Construction History

Design data on file with NJDEP include:

- 1) Design Report containing soil investigation and testing data, and hydraulic, hydrologic and structural design calculations prepared by Glenn Grubb, Design and Construction Engineer, S.C.S., dated February 19, 1959.
- 2) Geologic Report prepared by Robert Fonner, Geologist, S.C.S., dated February 27, 1959.
- 3) Construction Drawings prepared by S.C.S. engineers R. Rumer and R. Fox, dated August 1958.

The NJDEP file contains three Construction Inspection Reports summarized as follows:

October 2, 1959 - Exposed foundation material found to be pervious. Design modified to include cutoff trench.

October 22, 1959 - Cutoff trench extended down to bedrock due to pervious foundation material. Outlet pipe with cutoff collars and part of riser completed.

January 13, 1960 - Inspection prior to filling lake. Dam and appurtenances found to be externally adequate. Slide gate on riser malfunctioned on closing. Filling of lake postponed until gate was repaired.

Subsequently, the slide gate was repaired and the lake was filled. The dam and appurtenances have performed adequately since the time of construction.

g. Normal Operational Procedure

Operation of this dam and appurtenances is under the jurisdiction of the Stony Brook Millstone Watershed Association. The dam and appurtenances are externally inspected annually by the Watershed Association and representatives of the Mercer County Soil Conservation District. A minimum of five locations along the embankment are sampled for soil chemistry evaluation. Annual inspection reports are filed at the Watershed Association offices in Hopewell, New Jersey.

Maintenance at the site is performed based on the findings of the inspections. In the past six years annual maintenance generally has consisted of the following:

- 1) Spreading lime on embankment surfaces.
- 2) Mowing grass on the embankment and in the auxiliary spillway (once per year).
- 3) Clearing the lake shoreline of debris and overgrown vegetation.
- 4) Hand cutting woody growth on the embankment and in the auxiliary spillway.
- 5) Replacing small animal guard bars on trench drain outlet pipe.

Occasionally, muskrat holes are observed along the upstream embankment slope. Trapping programs are initiated and burrows are filled in.

In 1978, a major clearing program was undertaken to remove overgrown and woody vegetation from the outlet channel of the auxiliary spillway.

The principal spillway access opening cover plate was replaced after a trespasser was injured when he accidentally fell through the opening into the riser. The replacement cover was bolted in place and the bolt threads were notched to prevent the hatch from being opened.

Reportedly the lake has not been drawn down in the last six years. Soundings of the lake bottom have never been performed. Apparently there has been no observable sediment accumulation in the lake. The slide gate on the outlet works was tested three years ago and was found to be operationally adequate. The mechanism has not been checked recently.

1.3 Pertinent Data

a. Drainage Area 0.66 square miles

b. Discharge at Dam Site

Maximum known flood at dam site Unknown

Outlet works at normal pool
elevation 9.5 c.f.s.

Spillway capacity at top of dam 1731 c.f.s.

c. Elevation (N.G.V.D.)

Top of Dam 224.2

Maximum highwater (design) 222.4

Principal spillway crest (normal
pool) 216.0

Auxiliary spillway crest 220.6

Streambed at center line on dam 196.4

Maximum tailwater 212.0

d. Reservoir Length

Length at design surcharge 1450 feet

Length at normal pool 800 feet

e. Reservoir Storage (acre-feet)

SDF Maximum Stage 94

Normal pool 33

Top of dam 113

f. Reservoir Surface Area (Acres)

SDF maximum stage	12.3
Normal pool	5.6
Top of dam	13.4

g. Dam

Type	Zoned Earthfill
Length	650 feet
Height	27.8 feet
Sideslopes - Upstream	2.5 horiz. to 1 vert.
Downstream	2.5 horiz. to 1 vert.
Zoning	Earthfill over compacted silt and clay
Impervious core	Compacted silt and clay
Cutoff	Impervious core extended to bedrock
Grout curtain	None

h. Diversion and Regulating Tunnel N.A.

i. Principal Spillway

Type	Uncontrolled Rectangular Concrete Riser
Length of weir	14 feet
Crest elevation	216.0
Gates	none
Upstream channel	N.A.
Downstream channel	48" RCP Discharge Culvert

J. Auxiliary Spillway

Type	Trapezoidal grassed channel
Bottom width	75 feet
Sideslopes	3 horiz. to 1 vert.
Crest elevation	220.6
Gates	none
Upstream slope	0.02 feet/foot (Design)
Downstream slope	0.03 feet/foot (Design)

k. Regulating Outlets

12" dia. CMP manual slide gate controlled

SECTION 2: ENGINEERING DATA

2.1 Design

The following plans are available in the NJDEP file:

- 1) Design Report covering soil investigation and testing, and hydraulic, hydrologic and structural design calculations prepared by Glenn Grubb, Design and Construction Engineer, S.C.S., dated February 19, 1959.
- 2) Geologic Report prepared by Robert Fonner, Geologist, S.C.S., dated February 27, 1959.
- 3) Construction Drawings titled "Dam Site No. 7, Stony Brook Watershed" consisting of 6 sheets, prepared by S.C.S. engineers R. Rumer and R. Fox, dated August 1958:

Sheet 1 - Cover

Sheet 2 - Dam Site

Sheet 3 - Profile & Section of Dam

Sheet 4 - Emergency Spillway - Trench Drain -
Exit Channel

Sheet 5 - Structural Details

Sheet 6 - Steel Details

All investigative study, design calculations, construction drawings and specifications for the dam and appurtenances were prepared by the Soil Conservation Service.

The spillway facilities at Stony Brook Watershed Dam Site No. 7 were designed based on routing the design storm flood as determined by the S.C.S. in 1958. The dimensionless unit hydrograph method was used to develop the inflow hydrograph. The principal spillway was designed to attenuate an inflow hydrograph with a peak inflow rate of 517 c.f.s, while yielding a peak outflow of 257 c.f.s. and not developing flow in the auxiliary spillway. The combined spillways were designed to attenuate an inflow hydrograph with a peak inflow rate of 1829 c.f.s. while yielding a peak outflow of 1620 c.f.s. without overtopping the dam.

2.2 Construction

Stony Brook Watershed Dam No. 7 was constructed in 1959. Three construction inspections were performed by the Soil Conservation Service on October 2 and 22, 1959 and January 13, 1960. As a result of inspection findings the original embankment design was revised to include a cutoff trench to bedrock. As-built drawings are available from the Mercer County Soil Conservation District, Somerset, New Jersey.

2.3 Operation

Operation and maintenance of the dam and impoundment at Stony Brook Watershed Dam Site No. 7 is the responsibility of the Stony Brook Millstone Watershed Association as per the "Watershed Protection, Operation and Maintenance Agreement" between the S.C.S. and the Watershed Association on file with the NJDEP.

The NJDEP file contains the annual inspection report for 1974. A complete set of annual inspection reports for the years from 1960 to 1979 are available from the Stony Brook Millstone Watershed Association.

2.4 Evaluation

a. Availability

Comprehensive engineering data, design calculations and construction drawings for the dam and appurtenances, are available from the NJDEP file. Additional information pertaining to operation and maintenance of the facility is available through the Stony Brook Millstone Watershed Association.

b. Adequacy

The engineering data available from the NJDEP file and the Watershed Association file is adequate to permit an assessment of the hydraulic capacity of the spillways and the overall stability of the embankment.

c. Validity

Based on the findings of the field inspections, the information contained in the above referenced files for Stony Brook Watershed Dam Site No. 7 is essentially accurate with respect to the as-built conditions at the site. Furthermore, a cursory engineering review indicates that the design prepared is consistent with standard engineering practice.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

Stony Brook Watershed Dam Site No. 7 was inspected on November 16 and 28, 1979 by members of the staff of Storch Engineers. A copy of the visual inspection checklist is contained in Appendix 1. The following procedures were employed for the inspection:

1. The embankment of the dam, appurtenant structures and adjacent areas were examined.
2. The embankment and accessible appurtenant structures were measured and key elevations were determined by surveyor's level.
3. The embankment, appurtenant structures and adjacent areas were photographed.
4. Wet soft areas adjacent to the dam were noted and located.
5. The immediate downstream flood plain was toured to evaluate downstream development and restricting structures.
6. Depths of water were measured at various locations in the lake.

The following discussion relates observations made during the field inspection.

b. Dam

The earthfill embankment crest is straight and approximately level. There were two well defined vehicle tire paths extending along the entire embankment crest. The tire path areas exhibited a good stand of grass indicating infrequent traffic. There were no signs of subsidence or distress and the overall embankment was covered with moderate height, dense, hardy grass. No woody growth was observed on the embankment.

One narrow bare path was observed on the downstream embankment slope extending from the crest to the toe. The path was most likely a result of pedestrian traffic. The ground surface in the path was firm with no signs of erosion.

Several narrow deer paths were observed along both embankment slopes. Growth of vegetation was retarded slightly in these areas. No small animal burrows were observed along the embankment slopes.

The embankment toe adjacent to the principal spillway discharge culvert had been eroded slightly and a small scour pond about 3.3 feet deep had formed downstream of the culvert outlet.

Two soft wet areas were observed about 40 feet northeast of the toe of the embankment. Flow at each area was less than one half gallon per minute. In addition, a wet area was observed on the downstream side of the embankment between the principal spillway and the northwest end of the dam.

c. Appurtenant Structures

Principal Spillway

Most of the principal spillway (riser) was submerged or below grade, and therefore could not be inspected. The exposed portion of the spillway was in good condition with no cracks or spalls. The trash racks were sound and clear of debris. The access opening cover plate was sound and firmly fastened in place.

Auxiliary Spillway

The auxiliary spillway consists of a trapezoidal grassed channel, essentially as shown on the construction drawings. The entire spillway area was covered with moderate height, dense, hardy grass. No woody vegetation was observed in the channel.

Outlet Works

The outlet works for the dam were submerged and buried except for the upper portion of the manual slide gate stem. There was no gate wheel on the stem, therefore the gate was not tested for operability. The gate stem was rusted, but appeared to be in fair condition.

Discharge Culvert

Most of the discharge culvert is embedded within the embankment and could not be inspected. The culvert consisted of a reinforced concrete pipe, 48 inches in diameter. The exposed portion of the pipe was observed to be in good condition.

Trench Drain Outlet Pipe

Most of the trench drain outlet pipe was buried. The exposed portion was in good condition and the small animal guard was in place. The pipe was dry with no observable sediment collection on the invert.

d. Reservoir Area

The lake impounded by the dam is approximately 800 feet long and about 500 feet wide at the dam. The immediate shoreline area consists of undeveloped farm and forested land. The shore area slopes up away from the lake at about 8 percent. The surrounding land area is generally rolling. Most of the drainage area contributing to the lake consists of open farm land, pastures and some forested areas. In the vicinity of the spillway, soundings of the lake bottom indicate negligible sediment accumulation.

e. Downstream Channel

Discharge from the impoundment enters a clear natural stream that passes through a concrete culvert 10.5 feet high by 9.5 feet wide under N.J. Route 31. The streambed is about 10 feet wide in this area with a broad flat flood plain moderately forested with little undergrowth. Beyond Route 31 the natural stream continues approximately 500 feet to Stony Brook. One frame dwelling was located within 100 feet of the streambed, approximately 500 feet downstream from the dam.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

The water level in the impoundment at Stony Brook Watershed Dam Site No. 7 is normally naturally controlled by overflow at the principal spillway. The lake level does not normally reach the crest of the auxiliary spillway. There are no formal or informal procedures for operation of the control mechanisms at the site.

4.2 Maintenance of Dam

Reportedly, maintenance is performed as required by the annual inspection report recommendations. Normal annual maintenance includes: spreading lime, mowing grass, hand cutting woody growth, replacing small animal guard bars at trench drain outlet. The lake is not drawn down on a regular basis to permit inspection of the facilities or for monitoring of sediment accumulation.

Maintenance documentation is on file with the Stony Brook Millstone Watershed Association. Based on the observed conditions at the time of the field inspections, maintenance has been good.

4.3 Maintenance of Operating Facilities

Reportedly, the principal spillway has not been thoroughly inspected in the past six years, nor has the outlet works been tested.

Maintenance documentation for the operating facilities is not available.

4.4 Description of Warning System

There is no warning system for the dam and there is reportedly no program of periodic monitoring of the lake level during intense storms.

4.5 Evaluation of Operational Adequacy

The dam and appurtenances are assessed as being in good condition, although the condition of the outlet works is unknown at this time. The outlet works could not be inspected or tested at the time of inspection.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design Data

Size and hazard classification were used in conjunction with "Recommended Guidelines for Safety Inspection of Dams" published by the U.S. Army Corps of Engineers to establish the SDF (Spillway Design Flood) for Stony Brook Watershed Dam No. 7. The appropriate design range for this facility is 1/2PMF to PMF (Probable Maximum Flood). Since the characteristics of the dam and impoundment as described in Section 1 fall into the lower end of their respective categories, the 1/2 PMF was used as the SDF.

The SDF inflow hydrograph for Stony Brook Watershed Dam No. 7 (See Appendix 4) was calculated by the Soil Conservation Service Triangular Unit Hydrograph Method with the curvilinear transformation utilizing the HEC-1-DB computer program.

General hydrologic characteristics used in this method were computed using USGS quadrangles. The drainage area contributing to the impoundment is 0.66 square miles. Most of the watershed is rural farm land. The SDF peak inflow was computed to be 1187 c.f.s.

Reservoir storage capacities were estimated using surface areas measured from the original S.C.S. construction drawings. Spillway discharge rates were computed using weir and channel flow formulas appropriate for the configuration of the overflow sections (See Appendix 4). Tailwater conditions resulting from the N.J. Route 31 culvert (downstream) were used to

more accurately define the actual outflow characteristics. Spillway discharge with lake level equal to the top of dam was computed to be 1731 c.f.s.

Based on the appended calculations, the principal and auxiliary spillways would pass the SDF yielding a maximum reservoir water level at elevation 223.0. Therefore, a storm of magnitude equivalent to the SDF will pass through the Stony Brook Watershed Dam Site No. 7 with 1.2 feet of freeboard. Accordingly, the subject spillways are assessed as being adequate in accordance with the criteria developed by the U.S. Army Corps of Engineers.

b. Experience Data

Reportedly Stony Brook Watershed Dam Site No. 7 has never experienced overtopping or flow through the auxiliary spillway since construction in 1959.

c. Visual Observation

At the time of the field inspections there was no evidence of recent overtopping or flow in the auxiliary spillway.

d. Overtopping Potential

According to the hydrological and hydraulic analyses, a storm of intensity equivalent to the SDF will pass through the spillway and maintain approximately 1.2 feet of freeboard.

e. Drawdown Time

Reportedly, the lake has never been drawn down, therefore experience data is not available. Based on available information the calculated drawdown time (See Appendix 4) would be approximately 2 days.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observation

Based on observations made during the field inspections, the embankment did not exhibit external weakness, subsidence or slope instability. Two soft wet areas were observed about 40 feet downstream of the downstream embankment toe. These areas seemed to coincide with the location of the old streambed, possibly indicating minor seepage through the fractured bedrock foundation material. In addition, a wet area was observed on the downstream side of the embankment between the principal spillway and the northwest end of the dam.

The trench drain pipe was dry with no sediment collection along the invert, indicating negligible flow and a relatively impermeable core.

The scoured pond at the outlet of the discharge culvert has apparently developed as a result of occasional high storm discharges. To date the concrete outlet bent, or footing, (See Typical Section - Dam and Principal Spillway) has not been exposed or undermined, and erosion of the adjacent embankment areas has been negligible. However, under SDF conditions, scour depth in the pond and associated erosion could undermine the concrete outlet bent and result in unstable discharge culvert foundation conditions.

b. Generalized Soils Description

Generally, surficial soils at the dam site consist of silt and sand with some clay and significant organic matter in the lake basin. Underlying soils are composed of dark gray silt and silty clay with some sand and gravel. Bedrock is generally 5 to 15 feet below the natural ground surface. The bedrock surface is weathered in localized areas. Bedrock generally consists of hard Lockatong argillite with interbedded hard shale.

c. Design and Construction Data

Reviewing the design calculations prepared by the Soil Conservation Service and the recommended embankment design configuration presented in "Design of Small Dams" (ref.2), the dam as designed appears to be stable under SDF conditions.

d. Operating Records

Operating records for the dam and appurtenances are not available.

e. Post Construction Changes

Based on construction drawings in the NJDEP file and field inspections, there have been no external changes in the dam or appurtenances since their construction in 1959.

f. Seismic Stability

Stony Brook Watershed Dam Site No. 7 is located in Seismic Zone 1 as defined in "Recommended Guidelines for Safety Inspection of Dams," which is a zone of very low seismic

activity. Experience indicates that dams in Seismic Zone 1 will have adequate stability under seismic loading conditions, if stable under static loading conditions. This dam appears to be stable under static loading based on field inspection observations.

SECTION 7: ASSESSMENT AND RECOMMENDATIONS

7.1 Dam Assessment

a. Safety

Based on the hydraulic and hydrologic analyses performed the spillway facilities at Stony Brook Watershed Dam Site No. 7 are adequate and are capable of accommodating storm runoff equivalent to that computed for the SDF.

Based on the field inspections performed for this study, and a brief review the embankment configuration and S.C.S. design calculations, the dam appears externally stable.

b. Adequacy of Information

Information sources for this study included: 1) field investigations, 2) data from the NJDEP file (design report; geological report; test pit soil logs; soil testing results; foundation, structural and hydraulic/hydrologic calculations; dam inspection reports and the "Application for Permit for Construction or Repair of Dam"), 3) original and as-built construction drawings from the Mercer County Soil Conservation District files, 4) USGS quadrangles and 5) consultation with Stony Brook Millstone Watershed Association personnel. This information is adequate for a Phase I Assessment as outlined in "Recommended Guidelines for Safety Inspection of Dams."

c. Necessity for Additional Data/Evaluation

The data available and the evaluations performed are considered to be sufficient to permit a Phase I assessment of Stony Brook Watershed Dam Site No. 7.

7.2 Recommendations

a. Remedial Measures

It is recommended that a riprap splash pad and slope protection at the discharge culvert outlet be installed in the near future to stabilize the scoured streambed and adjacent embankment toe.

Two areas of seepage were observed at the toe of dam. Arrangements should be made in the near future to monitor the seepage on a monthly basis in order to detect any changes in its condition. The monitoring should be performed by a professional engineer experienced in the design and construction of dams.

The owner should, in the near future, develop an emergency action plan together with an effective warning system outlining actions to be taken by the operator to minimize downstream effects of an emergency at the dam.

b. Maintenance

The present program of annual inspection and maintenance performed by the owner at the dam site should be continued.

Two additional items should be checked annually:

- 1) operational adequacy of the outlet works.
- 2) rate of flow and transport of fine sediment at the noted wet areas.

In the near future, the owner of the dam should develop written operating procedures and a periodic maintenance plan to insure the safety of the dam.

PLATES

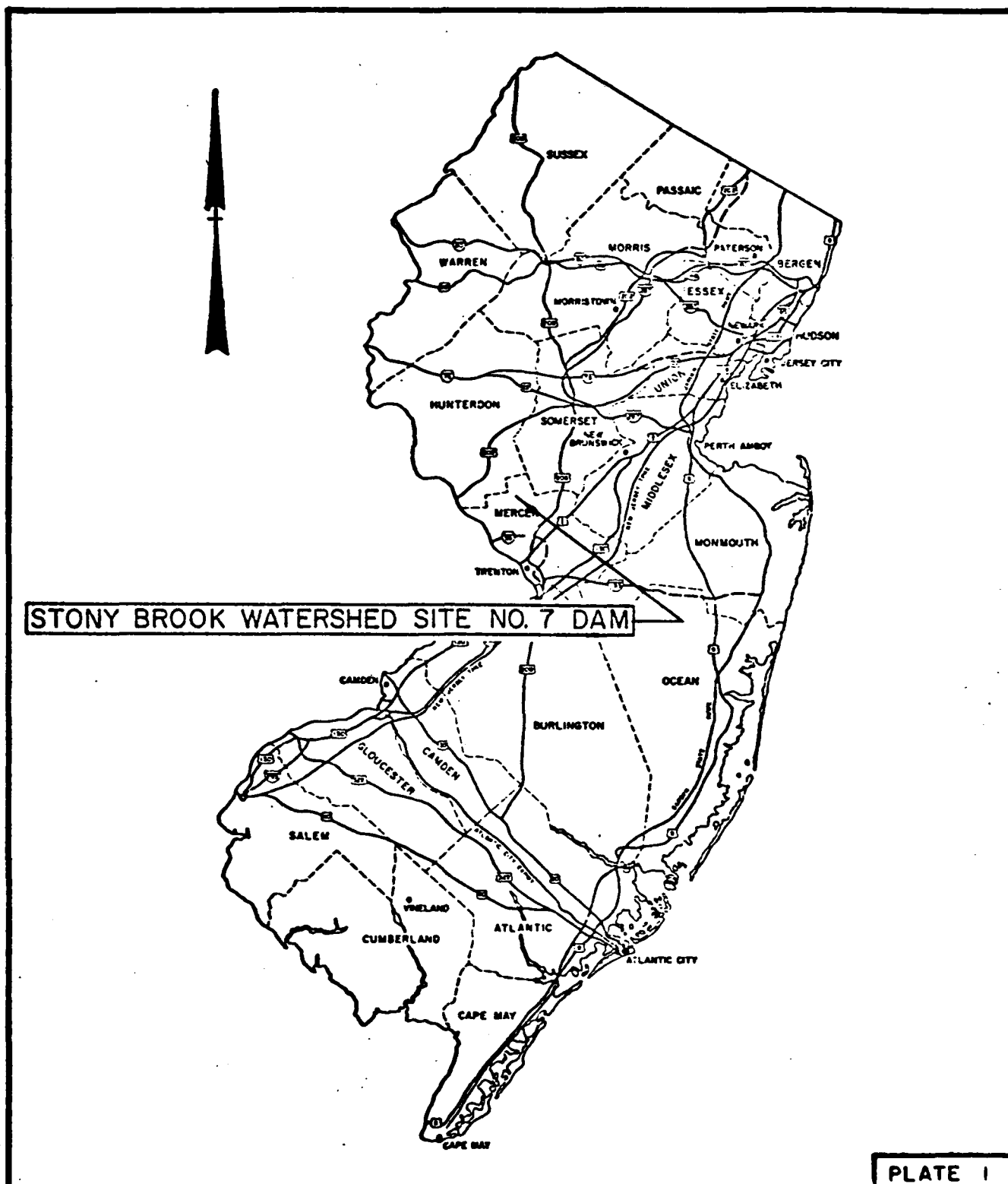
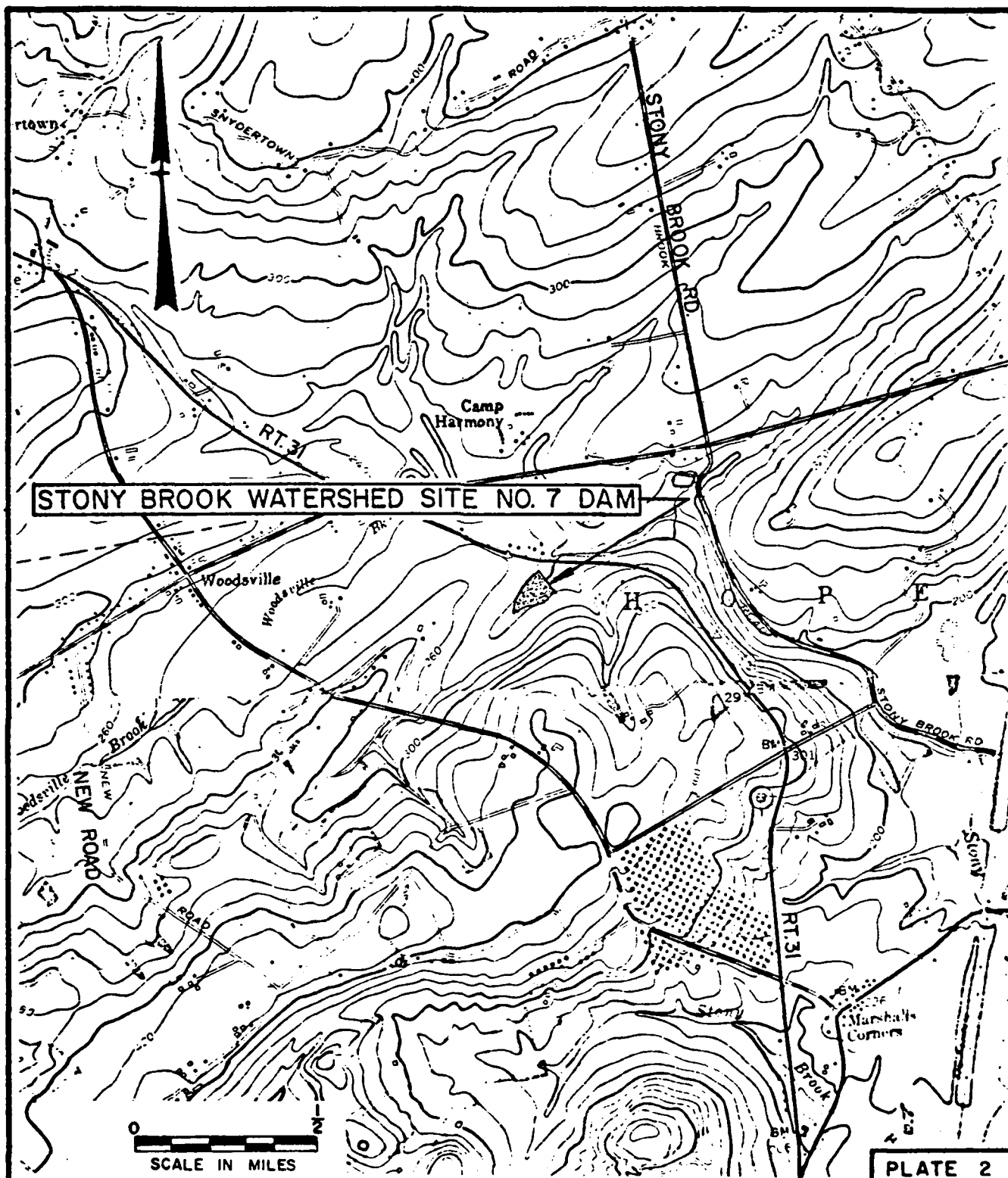


PLATE I

<p>STORCH ENGINEERS FLORHAM PARK, NEW JERSEY</p>	<p>INSPECTION AND EVALUATION OF DAMS KEY MAP STONY BROOK WATERSHED SITE No. 7 DAM</p>	
<p>DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY</p>	<p>I.D. N.J. 00344</p>	<p>SCALE: NONE</p>
		<p>DATE: NOV., 1979</p>



STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

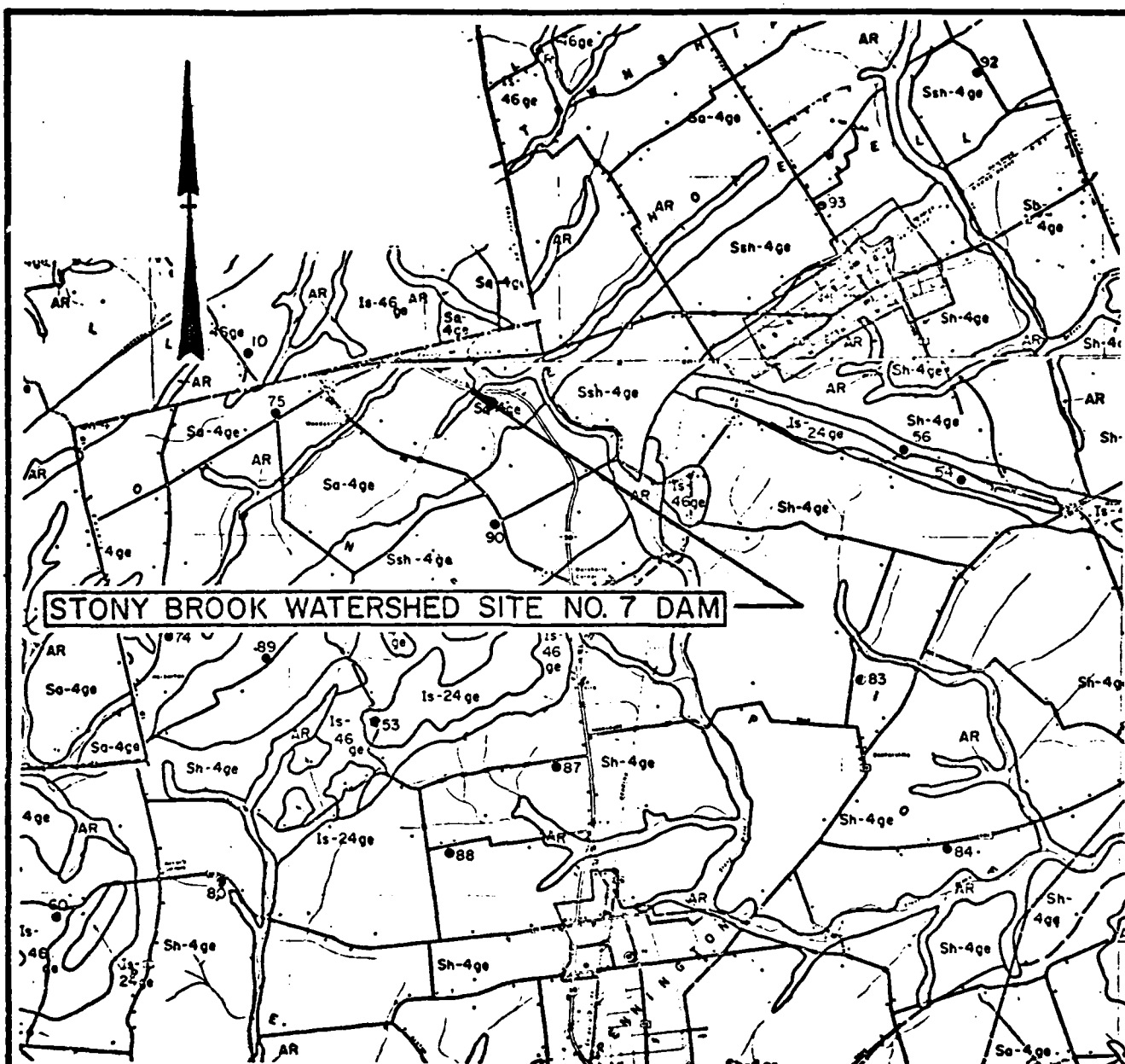
VICINITY MAP

STONY BROOK WATERSHED SITE No. 7 DAM

I. D. N. J. 00344

SCALE: AS SHOWN

DATE: NOV., 1979



Legend

AR

Silt and sand with some clay and significant organic matter near the surface.

Sa-4

Dark gray silt and silty clay.

Note:

Information taken from Rutgers University Soil Survey of New Jersey, Report No. 12, Mercer County and Geologic Map of New Jersey prepared by Lewis and Kummel.

PLATE 3

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

**DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY**

INSPECTION AND EVALUATION OF DAMS

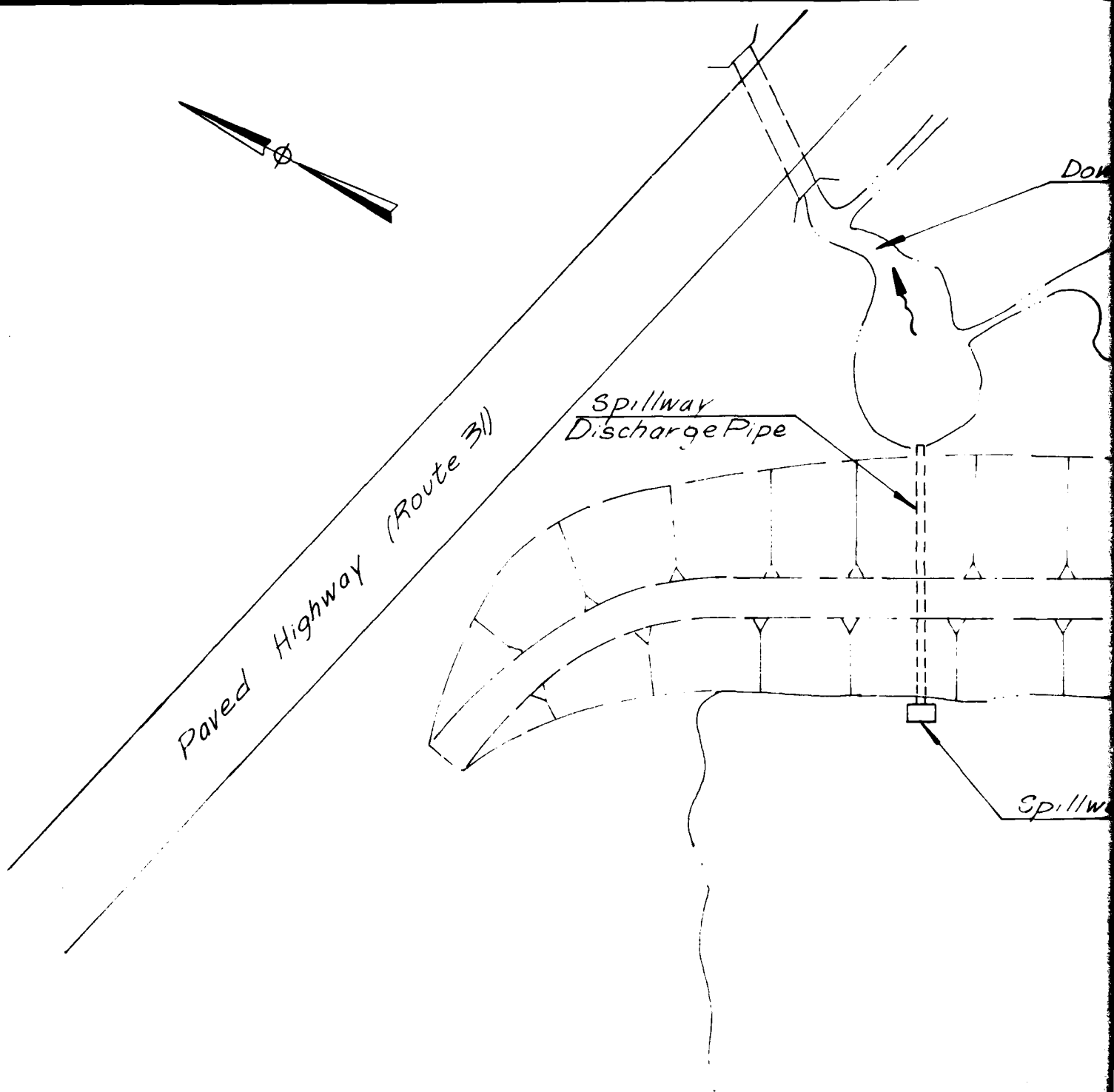
SOIL MAP

STONY BROOK WATERSHED SITE No. 7 DAM

I.D. NJ 00344

SCALE: NONE

DATE: NOV., 1979



Note:

1. Information taken from plans by Soil Conservation Service dated Sept. 10, 1958 and field inspection November 16, 1979

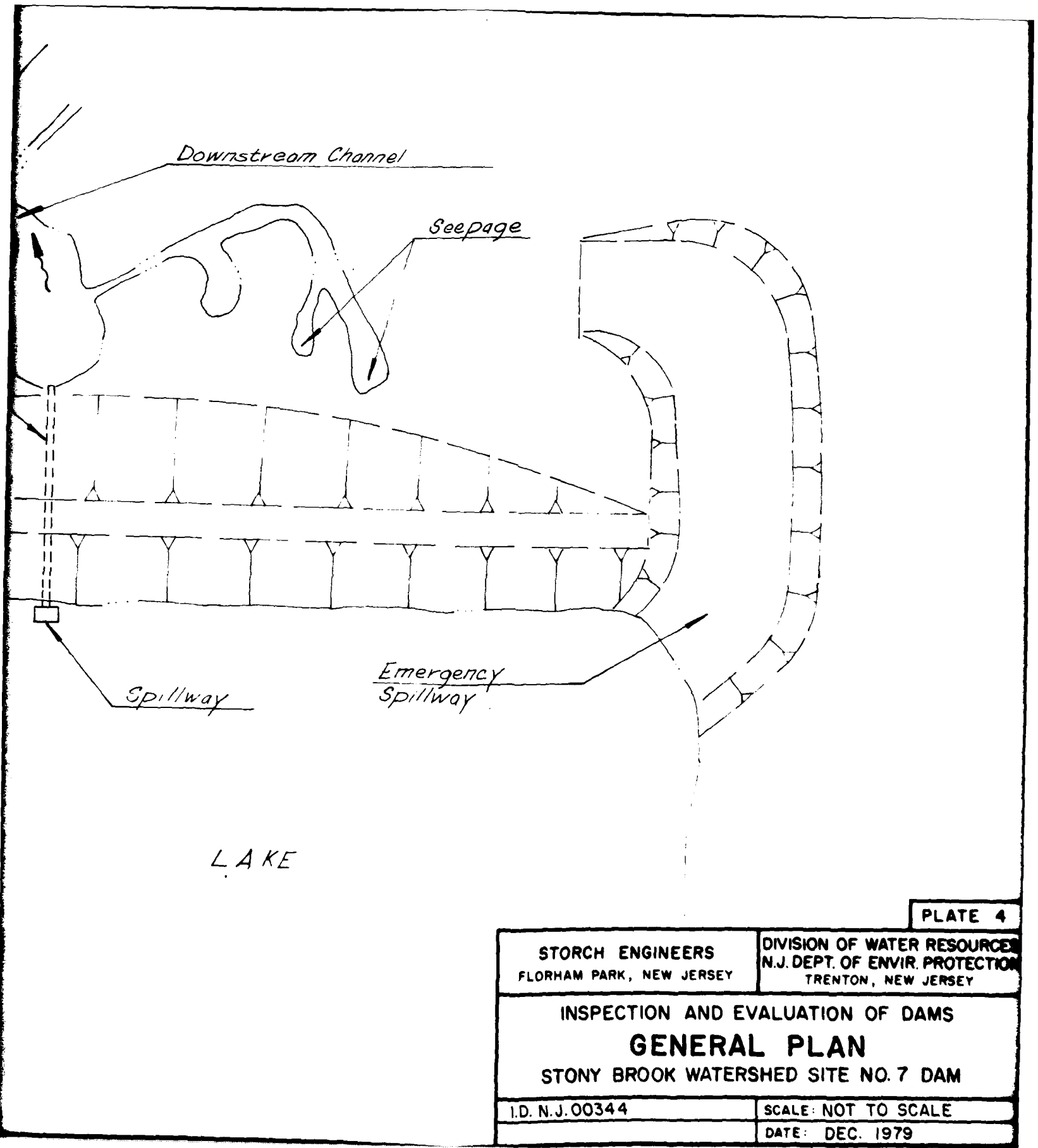


PLATE 4

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS
GENERAL PLAN
STONY BROOK WATERSHED SITE NO. 7 DAM

I.D. N.J. 00344

SCALE: NOT TO SCALE

DATE: DEC. 1979

Reinforced Concrete Rise
w/ Anti-Vortex Assembly

Manual Slide Gate

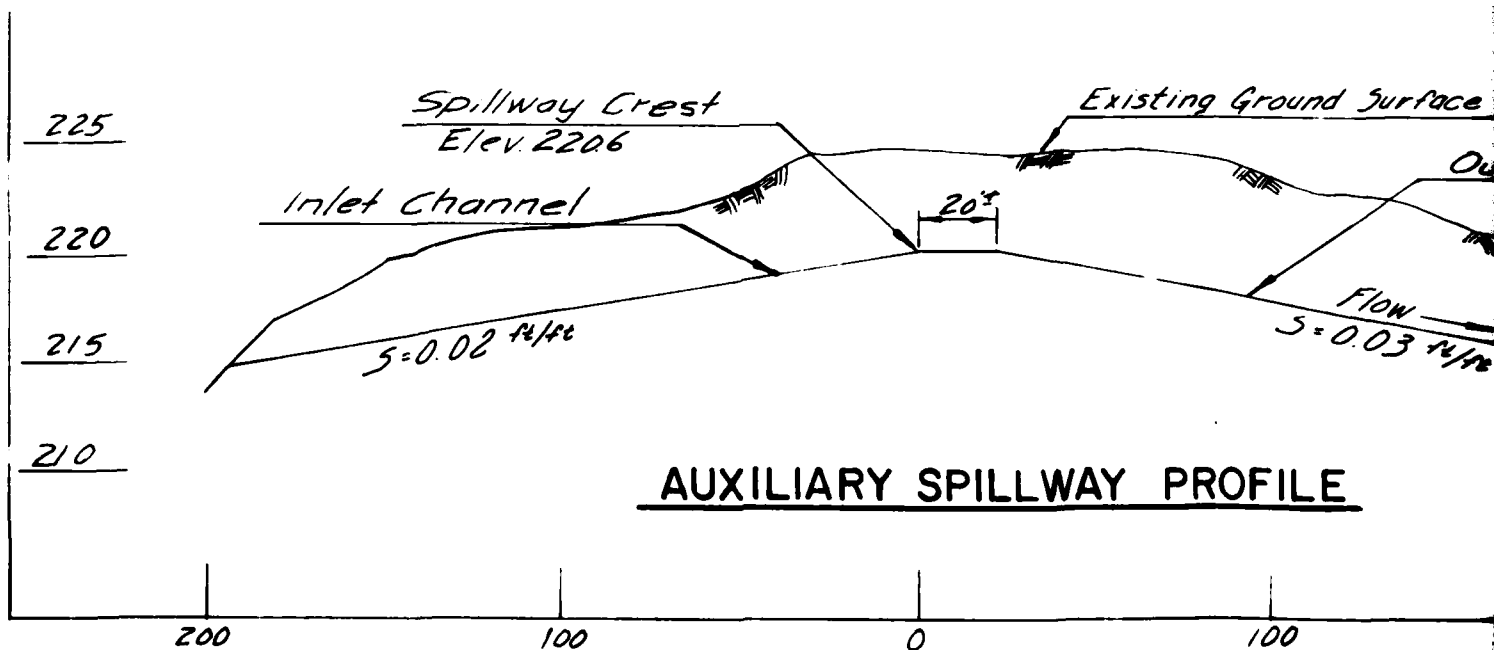
Normal Pool
Elev. 216.0

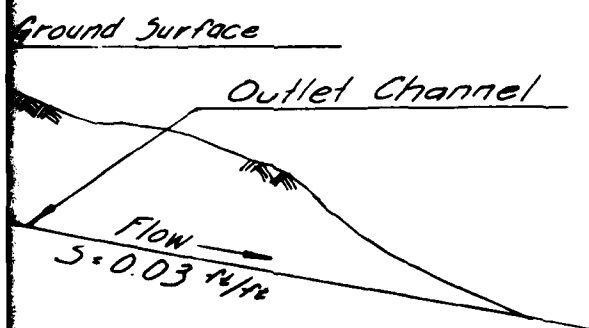
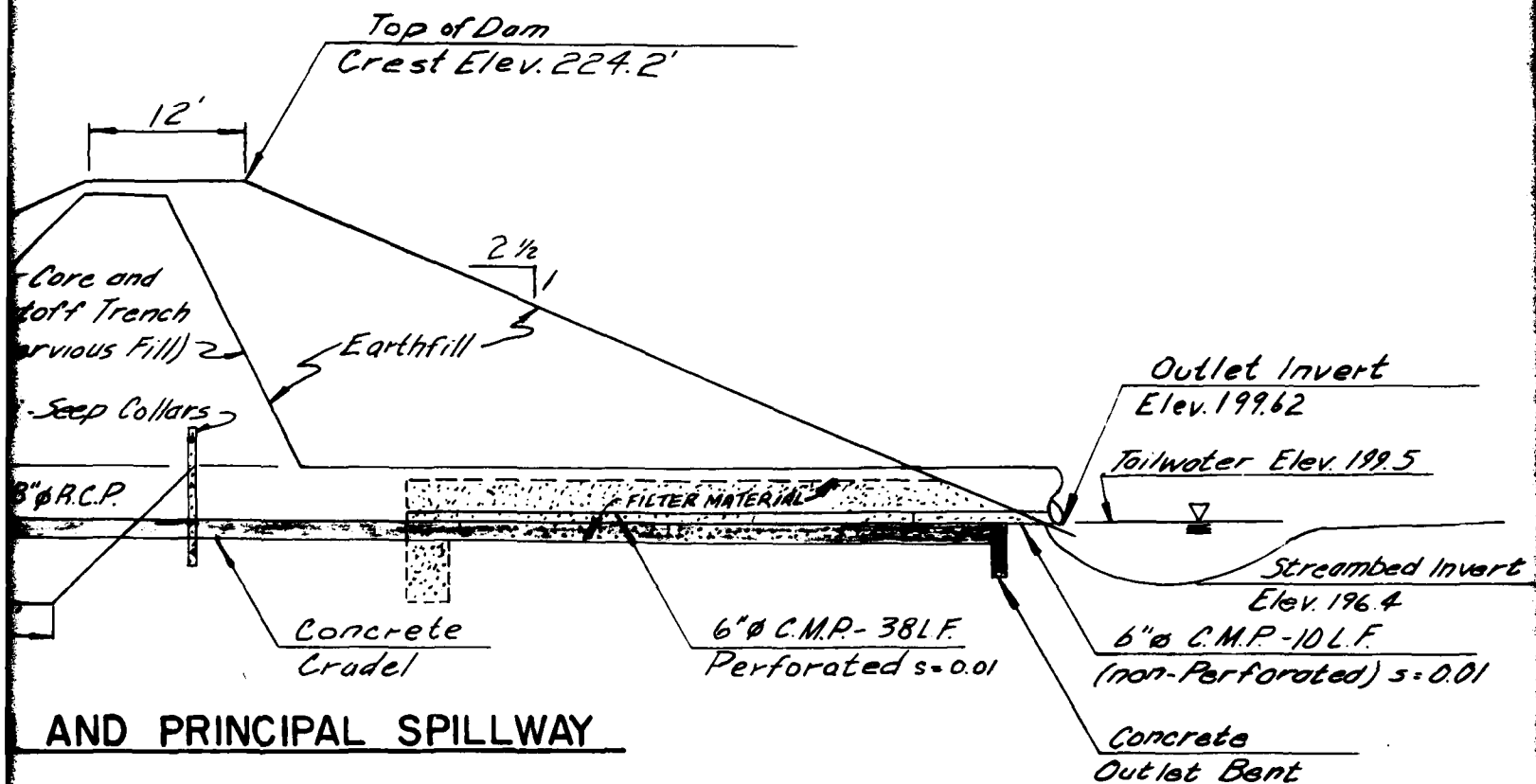
48" ϕ C.M.P.
Half Section

Outlet Work
Invert Elev. 2000

Riser Invert
Elev. 200.0

SECTION - DAM AND PRIN





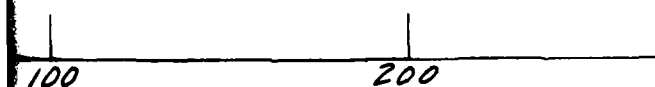
Note:

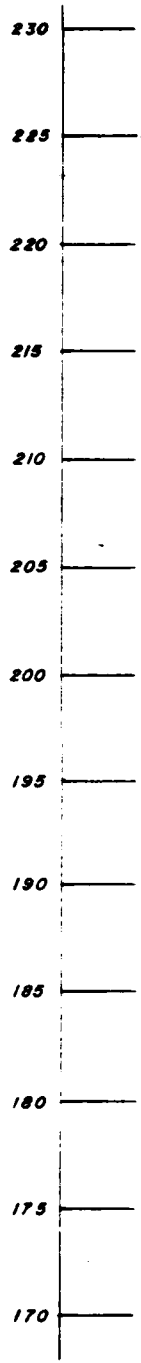
Information taken from "As-Built"
Construction Drawings Prepared By
U.S. Dept. of Agriculture, Soil Conservation
Service and Field Inspections on November
16, 1979 and November 28, 1979

PLATE 5

FILE

STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	DIVISION OF WATER RESOURCE N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY
INSPECTION AND EVALUATION OF DAMS TYPICAL SECTION DAM AND PRINCIPAL SPILLWAY STONY BROOK WATERSHED SITE No. 7 DAM	
I.D. N. J. 00344	SCALE: NOT TO SCALE
	DATE: JAN. 1979

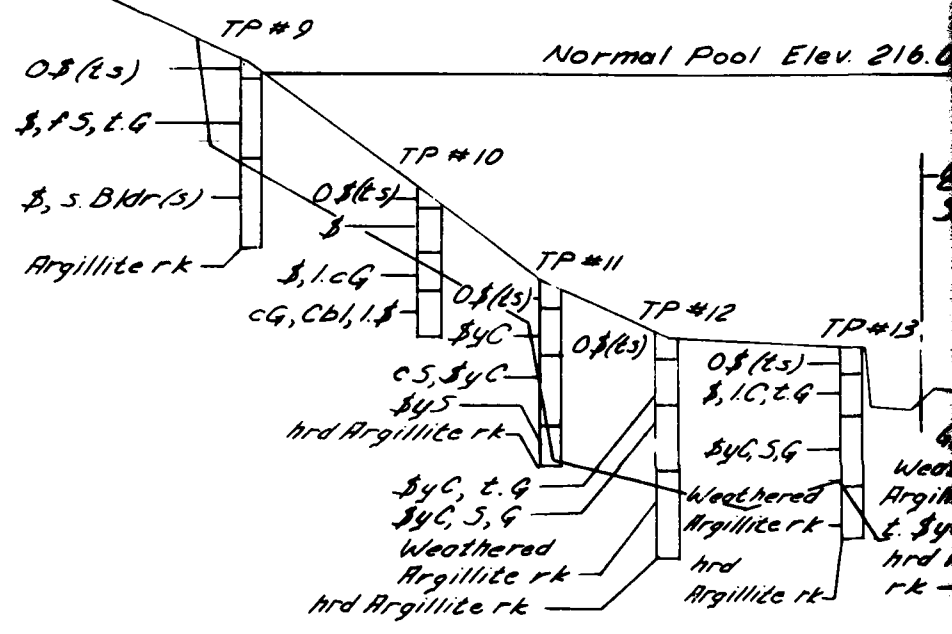




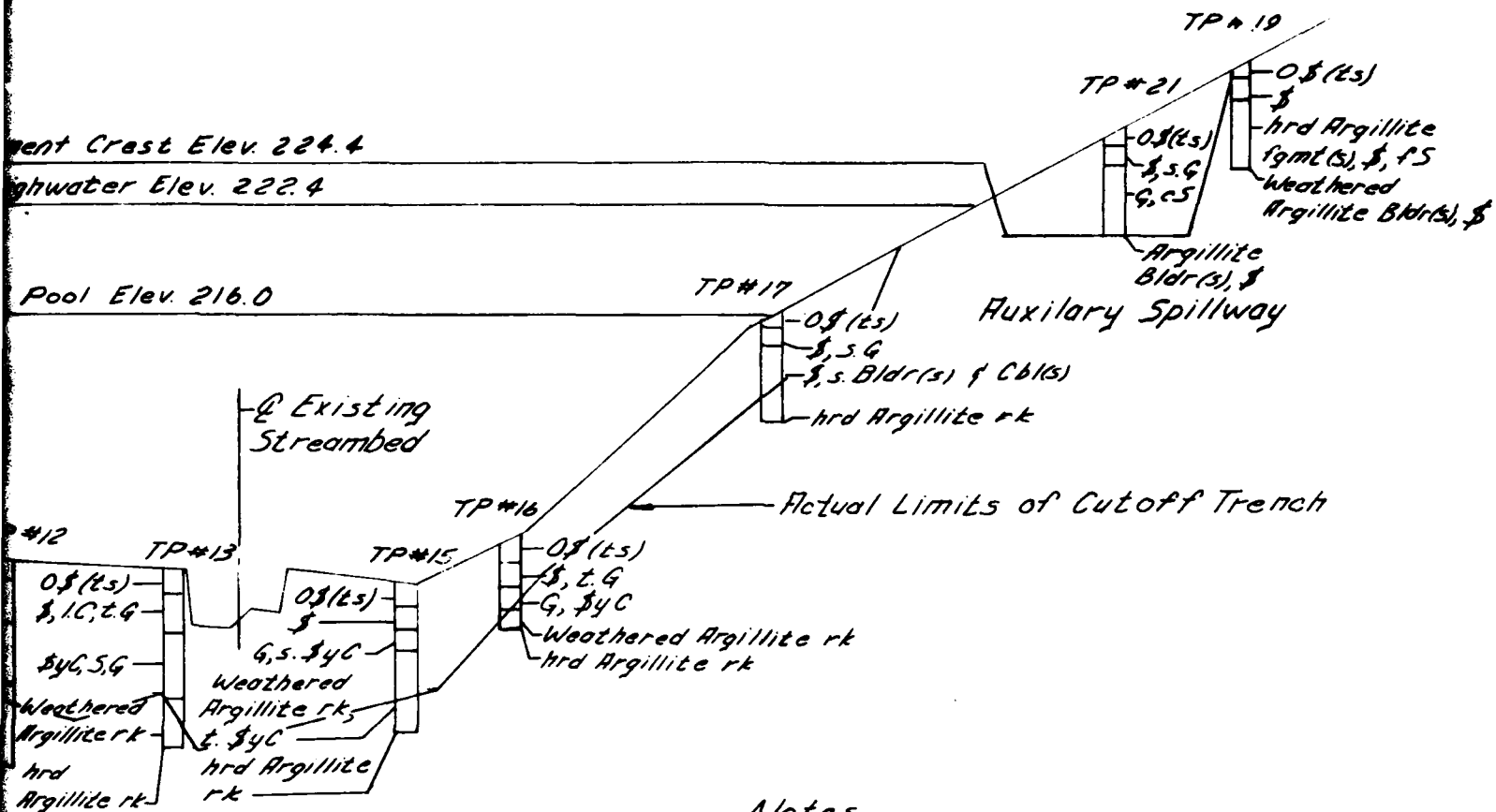
Earthfill Embankment Crest Elev.

Maximum Highwater Elev. 224

Normal Pool Elev. 216.0



C
S
\$
G
\$, y
O
Bldr (s)
Cbl (s)
rk
ts
+
/
S



Notes.

1. TP indicates Geological Investigation Test Pit locations.
2. Information taken from "Profile and Section of Dam", Sheet 3 of 6 prepared by Soil Conservation Service.

LEGEND

C	Clay	F	Fine
S	Sand	fgmt(s)	Fragments
\$	Silt	C	Course
G	Gravel		
\$y	Silty		
O	Organic		
Bldr(s)	Boulders		
Cbl(s)	Cobbles		
rk	Bedrock		
ts	Topsoil		
t	Trace		
l	Little		
S	Some		

PLATE 6

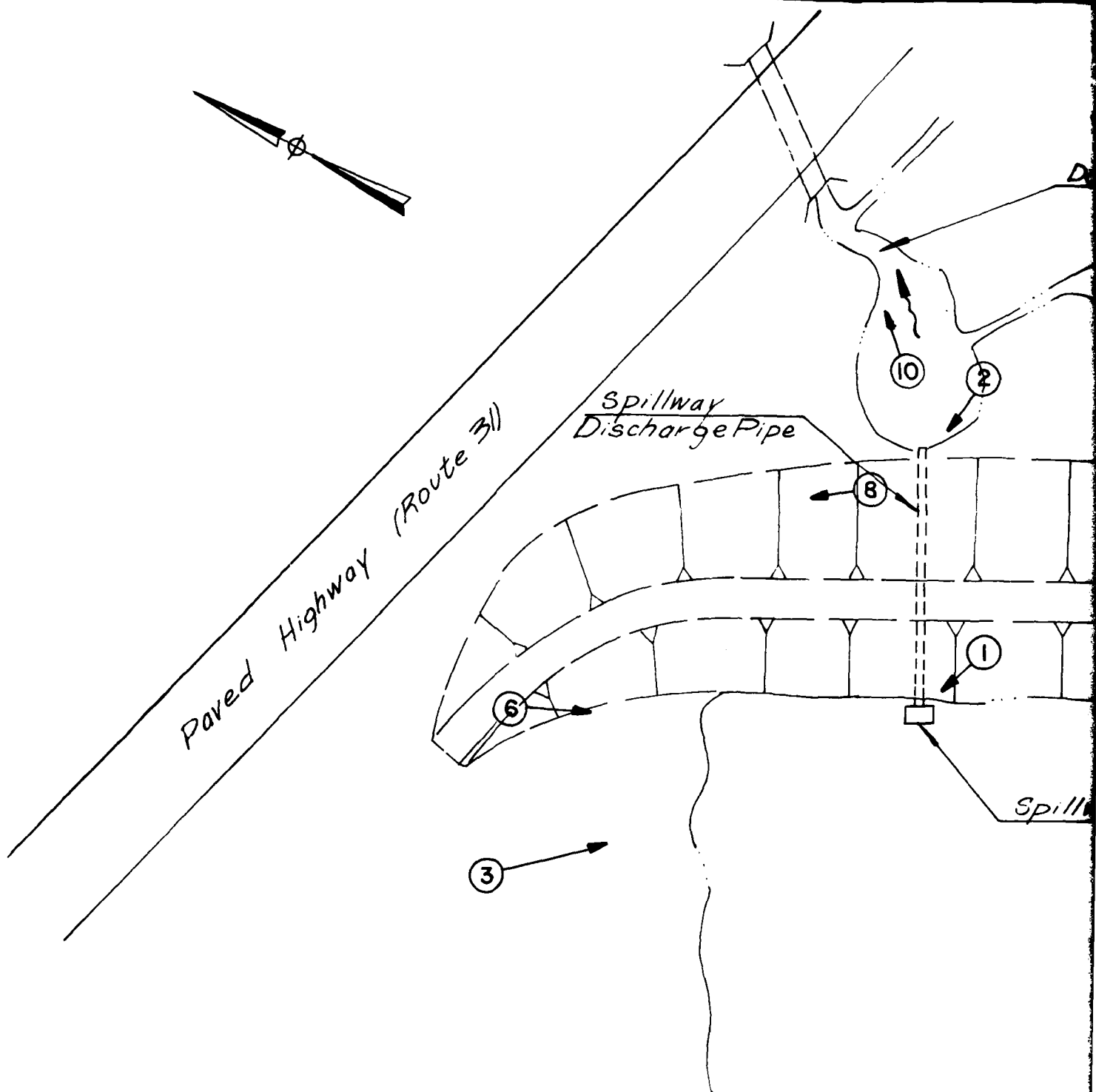
STORCH ENGINEERS
 FLORHAM PARK, NEW JERSEY

DIVISION OF WATER RESOURCE
 N.J. DEPT. OF ENVIR. PROTECTION
 TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS SOIL BORING DATA STONY BROOK WATERSHED DAM SITE NO. 7

SCALE: NOT TO SCALE

DATE: JANUARY, 1980



Note:

1. Information taken from plans by
Soil Conservation Service dated
Sept. 10, 1958 and field inspection
November 16, 1979

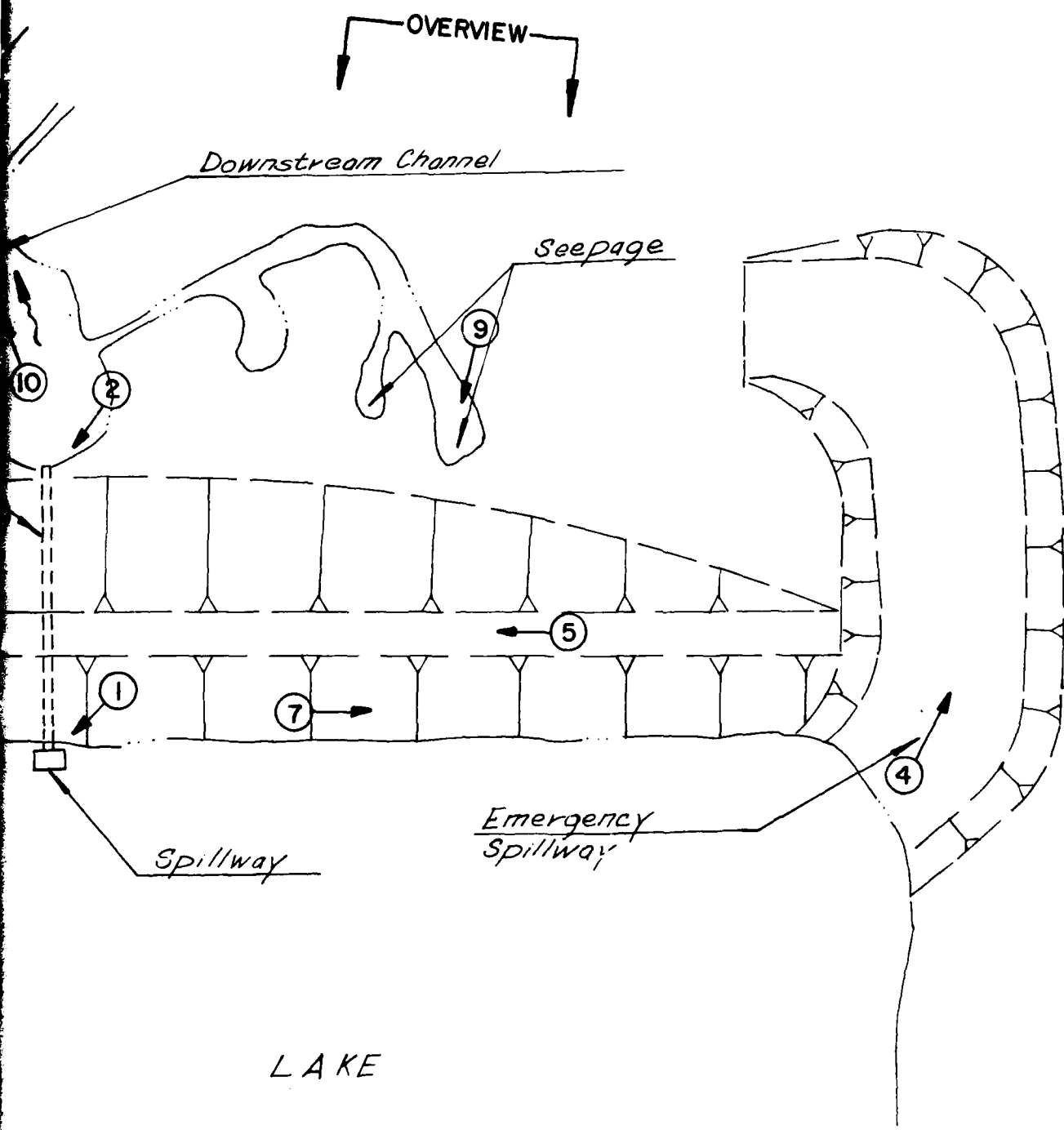


PLATE 7

STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY
INSPECTION AND EVALUATION OF DAMS PHOTO LOCATION PLAN STONY BROOK WATERSHED SITE NO. 7 DAM	
I.D. N.J. 00344	SCALE: NOT TO SCALE DATE: DEC. 1979

APPENDIX 1

Check List - Visual Inspection

Check List - Engineering Data

Check List
Visual Inspection
Phase I

Name of Dam Stony Brook Watershed County Mercer State New Jersey Coordinators NJDEP
Dam Site No. 7

Date(s) Inspection 11/16/79 Weather Sunny Temperature 60°F
11/28/79 Sunny 50°F

Pool Elevation at Time of Inspection +216.0 M.S.L. Tailwater at Time of Inspection +199.5 M.S.L.

Inspection Personnel:

John Gribbin Alan Volle Edward Wiltsie

Ronald Lai Thomas Miller

Richard McDermott

J. Gribbin Recorder

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
GENERAL	Grass covered earthfill embankment with well defined vehicle tracks along dam crest.	Overall good outward condition. No visible distress or subsidence. Several deer trails observed along upstream and downstream slopes of embankment.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	No erosion, seepage or clearly defined interface areas were observed. Eroded pond area in stream bed at downstream end of 48" diameter outlet pipe.	
ANY NOTICEABLE SEEPAGE	Two flowing wet areas located at the downstream toe of the earthfill embankment, south of the principal spillway outlet, in the vicinity of the original natural streambed. Approximate flow rate in these areas was less than 0.5 gpm.	Wet area observed on downstream face of embankment between principal spillway and northwest end of dam.
STAFF GAGE AND RECORDER	None	
DRAINS	6-inch diameter corrugated metal drain pipe located about 1' south of principal spillway outlet pipe with about the same outlet invert. No flow.	The exposed parts of the pipe was in good condition.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Very slight mounding of soil along normal pool waterline and downstream slope.	Apparently deer trails, hoof marks observ.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Regular and approximately level. Two well defined vehicle tire track paths extend along the entire length of the dam crest.	
RIPRAP FAILURES	N.A.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SURFACES IN OUTLET CONDUIT	Exposed portion of 48" RCP sound and clean with no signs of deterioration or distress.	
INTAKE STRUCTURE	Submerged	
OUTLET STRUCTURE	Outlet structure was submerged or buried, except at downstream end of outlet conduit, described above.	
OUTLET CHANNEL	Natural streambed with small scoured pond at downstream end of outlet pipe. Stream meanders to the Route #31 overpass with an irregular cross section containing an elevated coarse gravel and cobble area in the center of the streambed.	
GATE AND GATE HOUSING	Gate operating mechanism rusted, but in satisfactory condition.	Gate mechanism not operated at time of inspection.

PRINCIPAL SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE RISER	Concrete surfaces above water level in good condition with no visible signs of distress or deterioration. Flow passing through both end openings of riser.	
APPROACH CHANNEL	N.A.	
DISCHARGE CHANNEL	Same as outlet channel. 48" diameter RCP.	

AUXILIARY SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SPILLWAY CREST (CONTROL SECTION)	20' long level trapezoidal channel section with dense grass. No structural sill. Good condition.	
APPROACH CHANNEL	Trapezoidal channel. Good condition. Dense grass.	
DISCHARGE CHANNEL	Trapezoidal channel. Good condition. Dense grass.	

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
OTHER	None	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Slope of lake banks approx. 8%.	
SEDIMENTATION	Not known.	Purpose of dam was sediment retention.
STRUCTURES ALONG BANKS	None. (Forest and farmland).	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Deposits of coarse gravel and cobbles (scoured deposited).	
SLOPES	Channel Side Slopes: 10% to 15% Longitudinal Channel Gradient: 2%	
STRUCTURES ALONG BANKS	Route #31 reinforced concrete culvert about 200 feet downstream from the principal spillway outlet pipe. One residential dwelling within flood plain about 5 feet above the streambed, and about 500 feet downstream from the dam.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM REMARKS

DAM - PLAN	Construction drawings titled "Dam Site No. 7, Stony Brook Watershed, Mercer County, N.J." NJ404P prepared by Soil Conservation Service dated December 18, 1958 (Sheets 1, 2 and 3 of 6).
SECTIONS	
SPILLWAY - PLAN	
SECTIONS	Construction drawings titled "Emergency Spillway - Trench Drain-Exit Channel", "Structural Details" and "Steel Details" NJ404P Prepared by Soil Conservation Service dated December 18, 1958 (Sheet 4, 5 and 6 of 6).
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	
OUTLETS - PLAN	Construction drawings titled "Structural Details" NJ404P prepared by Soil Conservation Service dated December 18, 1958 (Sheet 5 of 6).
DETAILS	
CONSTRAINTS	Not Available
DISCHARGE RATINGS	Not Available
HYDRAULIC/HYDROLOGIC DATA	SCS computations prepared in 1959 for design of dam. (NJDEP file & Mercer County Soil Conservation District file).
RAINFALL/RESERVOIR RECORDS	Not Available.
CONSTRUCTION HISTORY	Three construction inspection reports by SCS dated October 2, 1959, October 22, 1959 and June 13, 1960. (NJDEP file).
LOCATION MAP	Available in SCS construction drawings.

ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	As-built cutoff trench was extended down to bedrock. Otherwise dam was constructed as per SCS construction drawings.
HIGH POOL RECORDS	None
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Annual inspections performed by Stony Brook Millstone Watershed Association in the company of Mercer County Soil Conservation District personnel.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	One accident in the past 6 years. Trespasser fell through access opening on top slab of principal spillway. Access opening cover replaced and bolt threads notched to prevent removal of securing nuts. Description contained on 1978 annual inspection report and 1979 Operations and Maintenance Inspection Report.
MAINTENANCE OPERATION RECORDS	Annual maintenance records on file with Stony Brook Millstone Watershed Association. Operation records are not available.

ITEM REMARKS

DESIGN REPORTS

"Design Report, Stony Brook Watershed, Desilting Basin Site No. 7" prepared by SCS dated February 19, 1959. (Comprehensive report including hydraulic/hydro-logic, structural, and soils and foundations analyses) (NJDEP file).

GEOLOGY REPORTS

Contained in SCS "Design Report" (above). Review of Geological Investigation Pits, soil testing (sieve and triaxial) and summary report (NJDEP file).

DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES

Contained in SCS "Design Report" (above) in NJDEP file.
Contained in SCS "Design Report" (above) in NJDEP file.

MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD

Contained in SCS "Design Report" (above) in Geology and Soils Section and contract drawings (NJDEP file).
Sheets 2 and 3 of 6 of contract drawings presents locations and logs for Geological Investigation Pits.
Sieve analyses and triaxial tests performed on soil samples taken at site.

POST-CONSTRUCTION SURVEYS OF DAM

None

BORROW SOURCES

Silty and clayey material from valley floor was used in dam core.
Excavated material from auxiliary spillway area was used outside of core.
From SCS "Design Report" in NJDEP file.

APPENDIX 2

Photographs



PHOTO 1

SPILLWAY STRUCTURE



PHOTO 2

SPILLWAY DISCHARGE PIPE OUTLET AND FOUNDATION DRAIN OUTLET

STONY BROOK WATERSHED SITE NO. 7 DAM
28 NOVEMBER 1979



PHOTO 3

29 NOVEMBER 1979

AUXILIARY SPILLWAY



PHOTO 4

28 NOVEMBER 1979

SECTION VIEW OF AUXILIARY SPILLWAY

STONY BROOK WATERSHED SITE NO. 7 DAM



PHOTO 5
CREST OF DAM



PHOTO 6
UPSTREAM FACE OF DAM WITH SPILLWAY STRUCTURE

STONY BROOK WATERSHED SITE NO. 7 DAM
28 NOVEMBER 1979



PHOTO 7
UPSTREAM FACE OF DAM



PHOTO 8
DOWNSTREAM FACE OF DAM

STONY BROOK WATERSHED SITE NO. 7 DAM
28 NOVEMBER 1979



PHOTO 9

SEEPAGE AT TOE OF DAM



PHOTO 10

CULVERT UNDER ROAD DOWNSTREAM FROM DAM

STONY BROOK WATERSHED SITE NO. 7 DAM
28 NOVEMBER 1979

APPENDIX 3

Engineering Data

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Moderate sloped (10%) cultivated farmland, a few small forested areas.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 216.0 (33 Acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): N.A.

ELEVATION MAXIMUM DESIGN POOL: 224.2

ELEVATION TOP DAM: 224.2

PRINCIPAL SPILLWAY CREST: Uncontrolled sharp-crested weir.

- a. Elevation 216.0
- b. Type 4' x 7' Rectangular reinforced concrete riser (Drop inlet)
- c. Width 10 inches
- d. Length 14 feet (7 feet on each of two parallel faces)
- e. Location Spillover Rectangular Concrete Riser
- f. Number and Type of Gates None

AUXILIARY SPILLWAY CREST: Uncontrolled trapezoidal grassed channel

- a. Elevation 220.6
- b. Type Trapezoidal channel with level crest
- c. Width Approx. 20'
- d. Length 75 feet (Bottom Width)
- e. Location Spillover Through natural wooded area adjacent to natural stream bed.
- f. Number and Type of Gates N.A.

OUTLET WORKS: (1) Slide gate controlled inlet pipe to discharge culvert.

- a. Type 12" diameter corrugated metal pipe with manual slide gate.
- b. Location Extends from the upstream riser face to the upstream embankment toe.
- c. Entrance invert 200.0
- d. Exit invert 200.0
- e. Emergency draindown facilities: Outlet work can be used.

HYDROMETEOROLOGICAL GAGES: N.A.

- a. Type N.A.
- b. Location N.A.
- c. Records N.A.

MAXIMUM NON-DAMAGING DISCHARGE:

(Lake stage equal to top of dam) 1731 cfs

APPENDIX 4

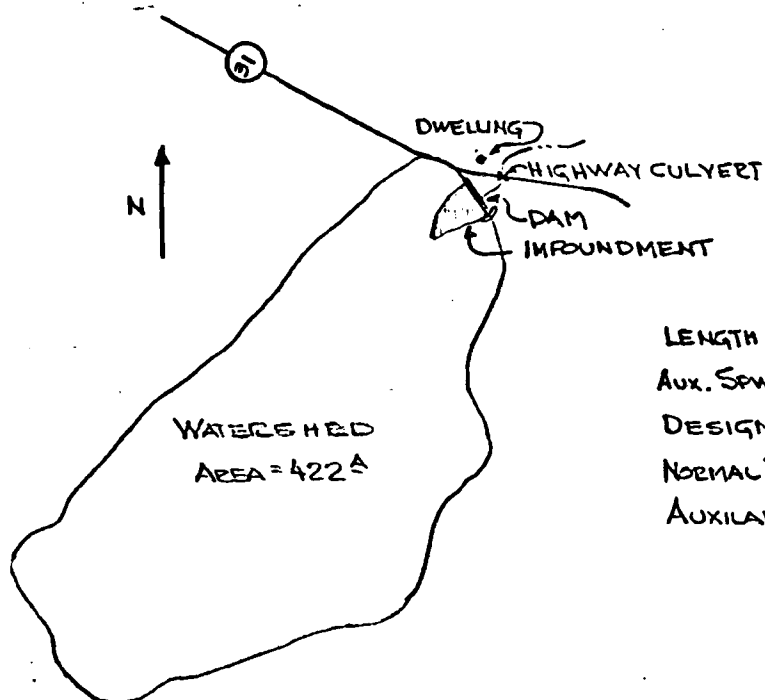
Hydraulic/Hydrologic Computations

STORCH ENGINEERS

Sheet 1 of 11

Project 1137-03 STONY P. DRAIN WATERSHED SITE No. 7 DAM Made By EAW Date Dec. 20, 1979

Chkd By STO Date 1/22/80



LENGTH OF DAM = 650'

Aux. Spwy. Width = 75' (BOTTOM)

DESIGN CREST EL. = 224.2' (EXIST.)

NORMAL POOL EL. = 216.0'

AUXILIARY SPILLY WAY CREST EL. 220.6

PLAN - WATERSHED & IMPOUNDMENT

1"=2000'

-HYDROLOGIC ANALYSIS-

INFLOW HYDROGRAPH FOR SITE No. 7 LAKE TO BE
COMPUTED BY HEC-1-DB COMPUTER PROGRAM
USING THE SCS TRIANGULAR UNIT HYDROGRAPH
AND ROUTED BY THE MODIFIED PULS METHOD.

DRAINAGE AREA = 0.66 SQ. MI.

INFILTRATION DATA -

DRAINAGE AREA SPARSELY POPULATED. PREDOMINANTLY
CULTIVATED FARM LAND

INITIAL INFILTRATION 1.5 IN.

CONSTANT INFILTRATION 0.15 IN/HR.

TIME OF CONCENTRATION - BY SCS TR-55

LENGTH OF OVERLAND FLOW = $L_1 = 2000'$ $S_1 = 6.6\%$ $v_1 = 1.5 \text{ fps}$
 $L_2 = 5000'$ $S_2 = 1.7\%$ $v_2 = 0.8 \text{ fps}$

$$T_c = t_1 + t_2 = 22 + 104 = 126 \text{ min} = \underline{\underline{2.1 \text{ hrs.}}}$$

BY "DESIGN OF SMALL DAMS"
SCS NOMOGRAPH

$$L = 7000' = 1.33 \text{ MI.}$$

$$H = 420 - 216 = 204'$$

$$T_c = \left(\frac{11.9 L^3}{H} \right)^{0.385} = \underline{\underline{0.46 \text{ hrs.}}}$$

BY N.I. HIGHWAY AUTHORITY NOMOGRAPH
DATED SEPT. 1952.

$$L_1 = 2000' \quad S_1 = 6.6\% \quad n = 0.040 \text{ (OPEN FIELD)}$$

$$L_2 = 5000' \quad S_2 = 1.7\% \quad n = 0.030 \text{ (REG. NAT. CHANNEL)}$$

$$T_c = T_{c1} + T_{c2} = 78 \text{ min} + 65 \text{ min} = \underline{\underline{2.4 \text{ hrs}}}$$

Project 1132-03 STONY BROOK WATERSHED SITE No. 7 DAM Made By EAW Date DEC 20, 1979Chkd By STO Date 1/22/80By "HANDBOOK OF APPLIED
HYDROLOGY", CHOW pg. 14-36

$$L = 7000'$$

$$S_{AVG.} = 3.1\%$$

$$n = 0.4$$

$$T_c = \sqrt[2.48]{\frac{1.48 L n}{S}} = 93 \text{ min.} = \underline{\underline{1.6 \text{ hrs}}}$$

FOR COMPUTER INPUT -USE $T_c = 2.0$ hrs.

$$LAG = \underline{\underline{1.2 \text{ hr.}}}$$

STAGE VS. STORAGETAKEN FROM ORIGINAL DESIGN CALCULATIONS
BY SCS.WATER SURFACE EL.
(FT. MSL)STORAGE VOL.
(ACRE-FT.)

204

0

210

7

214

21.5

218

43.5

222

80

224

110

[illegible]

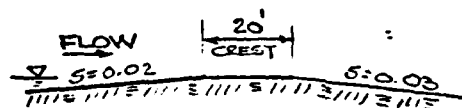
STRUCTURE HEIGHT = 34.2'
HYDRAULIC HEIGHT = 27.8'

-TYPICAL SECTION-

EARTHFILL EMBANKMENT

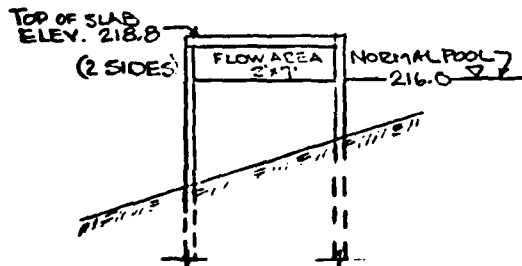


- CREST SECTION -
AUXILIARY SPILLWAY



- PROFILE -
AUXILIARY SPILLWAY

PRINCIPAL SPILLWAY



SPILLWAY FUNCTIONS AS SHARP CRESTED
WEIR FOR WATER ELEV'S FROM
216 TO 218.
ABOVE 218 OPENINGS ACT AS
SUBMERGED ORIFICE.

WEIR COEFFICIENT = 3.4 (HORIZ. SHARP-CRESTED)

$$Q = CLH^{3/2}$$

- WEIR FLOW -

H(EL)	Q(cfs)
0 (216)	0
0.5 (216.5)	16.8
1.0 (217.0)	47.6
1.5 (217.5)	87.4
2.0 (218.0)	134.6

- SURMERGED ORIFICE FLOW -

$$C = 0.62 \quad a = 2(7.0)2.0 = 28.0$$

$$Q = Ca\sqrt{2gh}$$

WATER SURFACE EL.	h (ft)	Q (cfs)
218.5	1.5	170.6
219.0	2.0	197.0
219.5	2.5	220.3
220.0	3.0	241.3
220.5	3.5	260.6
221.0	4.0	278.6
221.5	4.5	295.5
222.0	5.0	311.5
222.5	5.5	326.7
223.0	6.0	341.2
223.5	6.5	355.2
224.0	7.0	368.6
224.5	7.5	381.5
225.0	8.0	394.0
226.0	9.0	417.9

← DAM OVERTOPPED

OUTLET PIPE - TAILWATER (RT. 31 CULVERT)

WIDTH = 9.5' } RECTANGULAR AREA

HEIGHT = 10.5' }

INVERT INLET = 195.6'

INVERT OUTLET = 192.7'

LENGTH = 57'

S = 0.047

RE: "HYDRAULIC CHARTS FOR THE SELECTION OF HIGHWAY
CULVERTS" HEC No. 5, 1963

ASSUME CONSTANT FLOW FROM STREAM
BELOW DAM & U/S OF CULVERT = 200 cfs
(FROM ORIGINAL SCS COMP'S.)

ROUTE 31- CULVERT CAPACITY -

<u>Q</u> (cfs)	<u>HW</u> (ft)	<u>CULVERT</u> <u>HEADWATER</u> (EL.)
400	5.8	201.4
600	7.7	203.3
800	9.2	204.8
1000	11.0	206.6
1200	12.6	208.2
1400	15.2	210.8
1600	16.8	212.4
1800	20.5	216.1
2000	23.1	218.7

TAILWATER AT PRINCIPAL
SPILLWAY OUTLET.

INLET SUBMERGED*

ROADWAY OVERTOPPED
AT EL. 211'ASSUME MAX. TAILWATER
EL. = 212

* DOWNSTREAM FLOODPLAIN, STREAM BOTTOM SLOPE
‡ CULVERT BOTTOM SLOPE ARE ADEQUATE TO
MAINTAIN CULVERT IN INLET CONTROL.

AUXILIARY SPILLWAY CAPACITY -

RE: HANDBOOK OF HYDRAULICS, KING & BRATER

$$S_c = \frac{14.56 n^2}{D_m^{1/3}}$$

$$n_{\text{spillway}} = 0.035 \text{ (THICK MED. HEIGHT GRASS)}$$

WIDE CHANNEL - 75' WIDE / 3.6' DEEP

$$D_m = \text{AREA} / \text{TOP WIDTH} = r \text{ (HYDRAULIC RADIUS)}$$

$$S_{D/3} = 0.03 \text{ \%/ft}$$

$$D_m = 0.21 \text{ ft}$$

FOR $D_m > 0.24'$ THE D/S SLOPE OF 0.03
IS > THAN THE CRITICAL SLOPE.

$$\text{CHANNEL AREA} = 75 D_m$$

$$r = D_m$$

$$Q = A \frac{1.486}{n} r^{2/3} S^{1/2}$$

$$= 75 D_o \left(\frac{1.486}{0.035} \right) D_o^{2/3} (0.03)^{1/2}$$

$$= 551.5 D_o^{5/3}$$

$$D_{\text{RESERVOIR}} = D_o + Q^2 / 2ga^2$$

$$D_e = D_o + \frac{[551.5 D_o^{5/3}]^2}{2(32.2)(75)^2 D_o^2}$$

D_o (FT)	Q (CFS)	D_r (FT)	WATER EL. IN RES.
0.5	173.3	0.83	221.4
1.0	551.5	1.84	222.4
1.5	1085	2.95	223.5
2.0	1755	4.13	224.7
2.5	2547	5.37	226.0
3.0	3454	6.66	227.3

← DAM OVERTOPPED

DISCHARGE CULVERT CAPACITY (PRINCIPAL SPILLWAY) (L=105')

ACTS AS SUBMERGED ORIFICE AND OUTLET CONTROLLED.

RE: "HYDRAULIC CHARTS FOR THE SELECTION OF
HIGHWAY CULVERTS" HEC No. 5, 1963

Q (CFS)	HEAD (FT)
50	0.47
100	1.95
150	4.3
200	7.5
250	12.0
300	17.0
350	28.0

STORCH ENGINEERS

Sheet 8 of 11

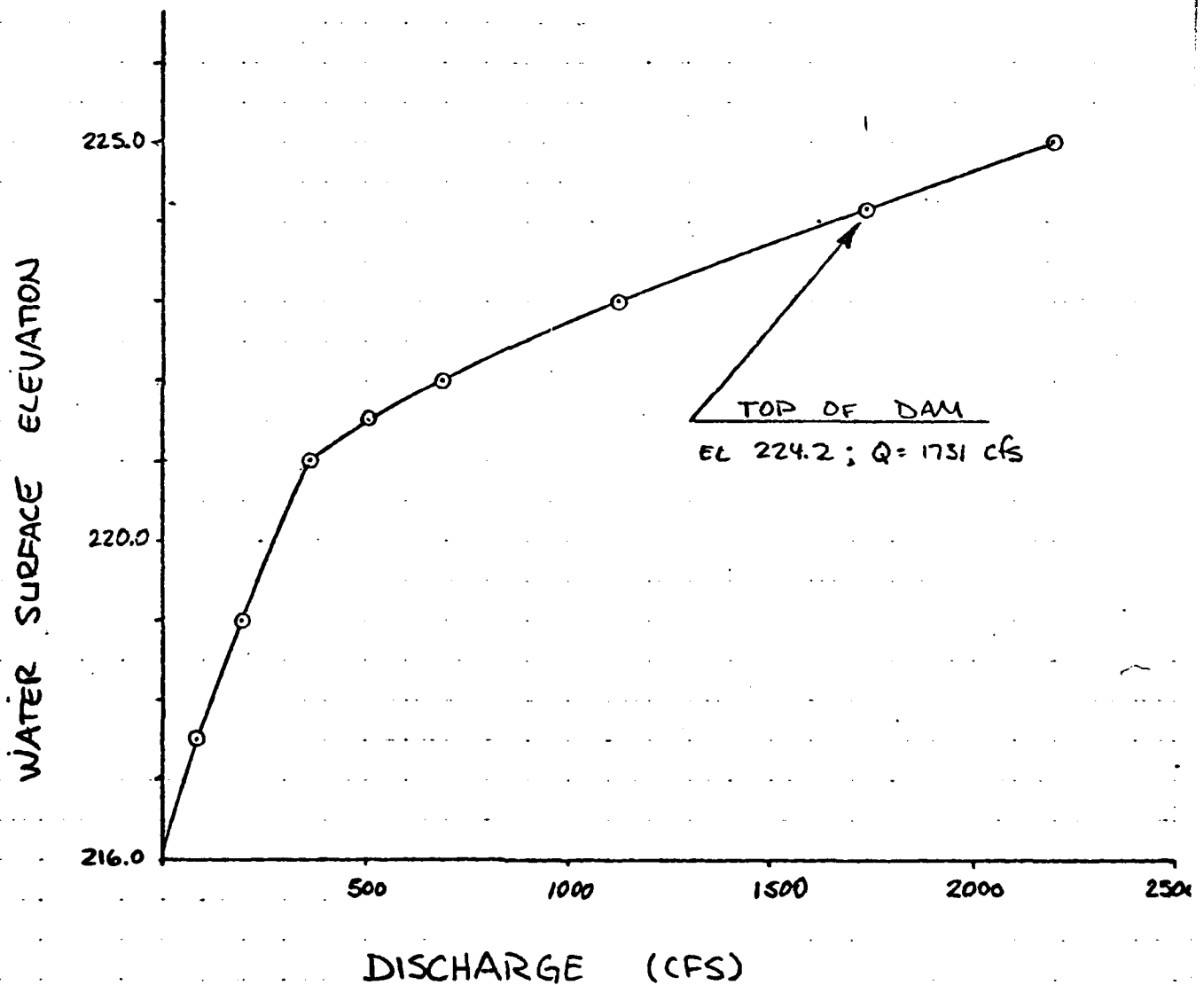
Project 1132-03 STONY BROOK WATERSHED SITE No. 7 Made By EAK Date DEC. 21, 1979

Chkd By STO Date 1/22/80

STAGE / DISCHARGE RELATIONSHIP

COMBINING THE ABOVE STAGE/FLOW
DATA :

WATER SURFACE EL.	Q _{OUT} (CFS)
216.0	0
216.5	17
217.0	48
217.5	87
218.0	135
219.0	197
220.0	241
220.6	264
221.0	366
221.5	507
222.0	690
223.0	1122
224.0	1615
224.2	1731
225.0	2198

STAGE - DISCHARGE CURVE

- RESERVOIR DRAWDOWN ANALYSIS -

DRAWDOWN WOULD BE ACCOMPLISHED BY OPENING THE OUTLET WORKS SLIDE GATE.

PRELIMINARY INVESTIGATION INDICATES THAT THE 24 LF OF 12" CMP WILL CONTROL OUTFLOW AND THE 48" RCP DISCHARGE CULVERT WILL PASS THE OUTFLOW WITH NO EFFECT ON THE OUTLET WORKS.

- RESERVOIR STORAGE -

WATER SURFACE ELEV.	STORAGE (ACRE-FT.)
204	0
210	7
214	22
216	33

- OUTLET WORKS DISCHARGE RATE -

WATER SURFACE ELEV.	DISCHARGE * RATE (cfs)
204	4.3
210	7.3
214	9.0
216	9.5

* DISCHARGE RATES COMPUTED USING "HYDRAULIC CHARTS FOR THE SELECTION OF HIGHWAY CULVERTS" CHART 11.

3 STAGE DRAWDOWN -

ELEV. 216 TO 214

$$\Delta S = 11 \text{ ACRE-FT} = 479,160 \text{ cf}$$

$$Q_{AVG} = \frac{9.5 + 9.0}{2} = 9.25 \text{ cfs}$$

$$AT = \frac{479,160}{9.25} = 51,801 \text{ SEC}$$

STORCH ENGINEERS

Sheet 11 of 11

Project 1132-03 STONY BROOK WATERSHED DAM SITE No. 7 Made By FAW Date JAN. 22, 1980

Chkd By STO Date 1/22/80

ELEV. 214 TO 210

$$AS_2 = 15 \text{ ACRE-FT.} = 653,400 \text{ cf}$$

$$Q_{AVG} = \frac{9.0 + 7.3}{2} = 8.15 \text{ cfs}$$

$$AT_2 = 653,400 / 8.15 = 80,172 \text{ SEC.}$$

ELEV. 210 TO 204

$$AS_3 = 7 \text{ ACRE-FT.} = 304,920 \text{ cf}$$

$$Q_{AVG} = \frac{7.3 + 4.3}{2} = 5.8 \text{ cfs}$$

$$AT_3 = 304,920 / 5.8 = 52,572 \text{ SEC.}$$

$$T_{TOTAL} = 184,545 \text{ SEC} = \underline{\underline{2.1 \text{ DAYS}}}$$

(NOTE: ASSUME NO INFLOW.)

HEC-1-DB COMPUTATIONS

NATIONAL DAM SAFETY PROGRAM									
STONY BROOK WATERSHED SITE NO. 7 DAM									
MULTI RATIO PNE ROUTING									
A1	150	0	10	0	0	0	0	0	3
A2	5	0.4	1	0.3	0.2	0.1			
A3	0.5	LAKE							
B1	0.5	2	0.56	107	1.5	0.15			1
J1	0.5	25.9	100						
K1	1	1.2							
M1	1	-0.05	2.0						
P1	1	DAM							
T1	-1.0								
X1	1								
X2	1								
X3	1								
Y1	1								
Y4	216.5	216.5	217.5	218.0	219	-216	220.6	221	221.5
Y5	222.0	223.0	224.2	225.0	197	241	264	346	507
Y6	690.0	117	87	135	197	241	264	346	507
Y7	690.0	1122	1731	2198	197	241	264	346	507
Y8	690.0	210	43.5	2198	197	241	264	346	507
Y9	690.0	210	218	222	197	241	264	346	507
Y10	690.0	210	218	222	197	241	264	346	507
Y11	690.0	210	218	222	197	241	264	346	507
Y12	690.0	210	218	222	197	241	264	346	507
Y13	690.0	210	218	222	197	241	264	346	507
Y14	690.0	210	218	222	197	241	264	346	507
Y15	690.0	210	218	222	197	241	264	346	507
Y16	690.0	210	218	222	197	241	264	346	507
Y17	690.0	210	218	222	197	241	264	346	507
Y18	690.0	210	218	222	197	241	264	346	507
Y19	690.0	210	218	222	197	241	264	346	507
Y20	690.0	210	218	222	197	241	264	346	507
Y21	690.0	210	218	222	197	241	264	346	507
Y22	690.0	210	218	222	197	241	264	346	507
Y23	690.0	210	218	222	197	241	264	346	507
Y24	690.0	210	218	222	197	241	264	346	507
Y25	690.0	210	218	222	197	241	264	346	507
Y26	690.0	210	218	222	197	241	264	346	507
Y27	690.0	210	218	222	197	241	264	346	507
Y28	690.0	210	218	222	197	241	264	346	507
Y29	690.0	210	218	222	197	241	264	346	507
Y30	690.0	210	218	222	197	241	264	346	507
Y31	690.0	210	218	222	197	241	264	346	507
Y32	690.0	210	218	222	197	241	264	346	507
Y33	690.0	210	218	222	197	241	264	346	507
Y34	690.0	210	218	222	197	241	264	346	507
Y35	690.0	210	218	222	197	241	264	346	507
Y36	690.0	210	218	222	197	241	264	346	507
Y37	690.0	210	218	222	197	241	264	346	507
Y38	690.0	210	218	222	197	241	264	346	507
Y39	690.0	210	218	222	197	241	264	346	507
Y40	690.0	210	218	222	197	241	264	346	507
Y41	690.0	210	218	222	197	241	264	346	507
Y42	690.0	210	218	222	197	241	264	346	507
Y43	690.0	210	218	222	197	241	264	346	507
Y44	690.0	210	218	222	197	241	264	346	507
Y45	690.0	210	218	222	197	241	264	346	507
Y46	690.0	210	218	222	197	241	264	346	507
Y47	690.0	210	218	222	197	241	264	346	507
Y48	690.0	210	218	222	197	241	264	346	507
Y49	690.0	210	218	222	197	241	264	346	507
Y50	690.0	210	218	222	197	241	264	346	507
Y51	690.0	210	218	222	197	241	264	346	507
Y52	690.0	210	218	222	197	241	264	346	507
Y53	690.0	210	218	222	197	241	264	346	507
Y54	690.0	210	218	222	197	241	264	346	507
Y55	690.0	210	218	222	197	241	264	346	507
Y56	690.0	210	218	222	197	241	264	346	507
Y57	690.0	210	218	222	197	241	264	346	507
Y58	690.0	210	218	222	197	241	264	346	507
Y59	690.0	210	218	222	197	241	264	346	507
Y60	690.0	210	218	222	197	241	264	346	507
Y61	690.0	210	218	222	197	241	264	346	507
Y62	690.0	210	218	222	197	241	264	346	507
Y63	690.0	210	218	222	197	241	264	346	507
Y64	690.0	210	218	222	197	241	264	346	507
Y65	690.0	210	218	222	197	241	264	346	507
Y66	690.0	210	218	222	197	241	264	346	507
Y67	690.0	210	218	222	197	241	264	346	507
Y68	690.0	210	218	222	197	241	264	346	507
Y69	690.0	210	218	222	197	241	264	346	507
Y70	690.0	210	218	222	197	241	264	346	507
Y71	690.0	210	218	222	197	241	264	346	507
Y72	690.0	210	218	222	197	241	264	346	507
Y73	690.0	210	218	222	197	241	264	346	507
Y74	690.0	210	218	222	197	241	264	346	507
Y75	690.0	210	218	222	197	241	264	346	507
Y76	690.0	210	218	222	197	241	264	346	507
Y77	690.0	210	218	222	197	241	264	346	507
Y78	690.0	210	218	222	197	241	264	346	507
Y79	690.0	210	218	222	197	241	264	346	507
Y80	690.0	210	218	222	197	241	264	346	507
Y81	690.0	210	218	222	197	241	264	346	507
Y82	690.0	210	218	222	197	241	264	346	507
Y83	690.0	210	218	222	197	241	264	346	507
Y84	690.0	210	218	222	197	241	264	346	507
Y85	690.0	210	218	222	197	241	264	346	507
Y86	690.0	210	218	222	197	241	264	346	507
Y87	690.0	210	218	222	197	241	264	346	507
Y88	690.0	210	218	222	197	241	264	346	507
Y89	690.0	210	218	222	197	241	264	346	507
Y90	690.0	210	218	222	197	241	264	346	507
Y91	690.0	210	218	222	197	241	264	346	507
Y92	690.0	210	218	222	197	241	264	346	507
Y93	690.0	210	218	222	197	241	264	346	507
Y94	690.0	210	218	222	197	241	264	346	507
Y95	690.0	210	218	222	197	241	264	346	507
Y96	690.0	210	218	222	197	241	264	346	507
Y97	690.0	210	218	222	197	241	264	346	507
Y98	690.0	210	218	222	197	241	264	346	507
Y99	690.0	210	218	222	197	241	264	346	507
Y100	690.0	210	218	222	197	241	264	346	507

.....
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION JULY 1978
 LAST MODIFICATION 26 FEB 79

RUN DATE# 79/12/28.
 TIME# 11.25.41.

NATIONAL DAM SAFETY PROGRAM
 STONY BROOK WATERSHED SITE NO. 7 DAM
 MULTI RATIO PHF ROUTING

NQ	MNR	NMIN	IDAY	IMR	IMIN	METRC	IPLT	IPRI	NSTAN
150	0	10	0	0	0	3	0	3	0
		JOPER	NUT	LROPT	TRACE				
		5	0	0	0				

MULTI-PLAN ANALYSES TO BE PERFORMED
 NPLAN= 1 NRTIO= 5 LRTIO= 1
 RTIOS= .50 .40 .30 .20 .10

.....
 SUB-AREA RUNOFF COMPUTATION
 INFLOW HYDROGRAPH TO SITE NO. 7 DAM
 ISTAQ ICOMP IECON ITAPE JPLT JPRIT INAME ISTAGE IAUO
 LAKE 0 0 0 0 0 0 0 0 0 0

IMYDG	IUMG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	.66	0.00	.66	0.00	0.000	0	1	0

PRECIP DATA
 R6 R12 R24 R48 R72 R96
 SPEE PMS 25.90 100.00 107.00 117.00 0.00 0.00 0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LROPT	STYKR	OLTKR	RTIOL	ERAIN	STYKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.50	.15	0.00	0.00

LOSS DATA
 TC= 0.00 UNIT HYDROGRAPH DATA
 LAG= 1.20

RECESSION DATA
 STARTQ= -1.00 URCSN= -.05 RTIOR= 2.00
 UNIT HYDROGRAPH 38 END OF PERIOD ORIGINATES, TC= 0.00 HOURS, LAG= 1.20 VOL= 1.00
 13. 38. 14. 126. 14. 225. 246. 248. 248. 236. 219.
 187. 152. 117. 114. 176. 8. 6. 4. 5. 3. 27.
 122. 11. 9. 8. 6. 0. 0. 0. 0. 0. 3.
 2. 1. 1. 1. 0. 0. 0. 0. 0. 0. 3.

MO.	DA	HR.	MIN	PERIOD	RAIN	EXCS	LOSS	COMP
1	.01	.	10	1	.	0	.	1.
1	.01	.	20	2	.	0	.	1.
1	.01	.	30	3	.	0	.	1.
1	.01	.	40	4	.	0	.	1.
1	.01	.	50	5	.	0	.	1.
1	.61	1	00	6	.	0	.	1.
1	.01	1	10	7	.	0	.	1.
1	.01	1	20	8	.	0	.	1.
1	.01	1	30	9	.	0	.	1.
1	.01	1	40	10	.	0	.	1.
1	.01	1	50	11	.	0	.	1.
1	.01	2	00	12	.	0	.	1.
1	.01	2	10	13	.	0	.	1.
1	.01	2	20	14	.	0	.	1.
1	.01	2	30	15	.	0	.	1.
1	.01	2	40	16	.	0	.	1.
1	.01	2	50	17	.	0	.	1.
1	.01	3	00	18	.	0	.	1.
1	.01	3	10	19	.	0	.	1.
1	.01	3	20	20	.	0	.	1.
1	.01	3	30	21	.	0	.	1.
1	.01	3	40	22	.	0	.	1.
1	.01	3	50	23	.	0	.	1.
1	.61	4	00	24	.	0	.	1.
1	.01	4	10	25	.	0	.	1.
1	.01	4	20	26	.	0	.	1.
1	.01	4	30	27	.	0	.	1.
1	.01	4	40	28	.	0	.	1.
1	.01	4	50	29	.	0	.	1.
1	.01	5	00	30	.	0	.	1.
1	.01	5	10	31	.	0	.	1.
1	.01	5	20	32	.	0	.	1.
1	.01	5	30	33	.	0	.	1.
1	.01	5	40	34	.	0	.	1.
1	.01	5	50	35	.	0	.	1.
1	.01	6	00	36	.	0	.	1.
1	.01	6	10	37	.	0	.	1.
1	.01	6	20	38	.	0	.	1.
1	.01	6	30	39	.	0	.	1.
1	.01	6	40	40	.	0	.	1.
1	.01	6	50	41	.	0	.	1.
1	.01	7	00	42	.	0	.	1.
1	.01	7	10	43	.	0	.	1.
1	.01	7	20	44	.	0	.	1.
1	.01	7	30	45	.	0	.	1.
1	.01	7	40	46	.	0	.	1.
1	.01	7	50	47	.	0	.	1.
1	.01	8	00	48	.	0	.	1.
1	.01	8	10	49	.	0	.	1.
1	.01	8	20	50	.	0	.	1.
1	.01	8	30	51	.	0	.	1.
1	.01	8	40	52	.	0	.	1.
1	.01	8	50	53	.	0	.	1.
1	.01	9	00	54	.	0	.	1.
1	.01	9	10	55	.	0	.	1.
1	.01	9	20	56	.	0	.	1.
1	.01	9	30	57	.	0	.	1.
1	.01	9	40	58	.	0	.	1.
1	.01	9	50	59	.	0	.	1.
1	.01	10	00	60	.	0	.	1.
1	.01	10	10	61	.	0	.	1.
1	.01	10	20	62	.	0	.	1.
1	.01	10	30	63	.	0	.	1.
1	.01	10	40	64	.	0	.	1.
1	.01	10	50	65	.	0	.	1.
1	.01	11	00	66	.	0	.	1.
1	.01	11	10	67	.	0	.	1.
1	.01	11	20	68	.	0	.	1.
1	.01	11	30	69	.	0	.	1.
1	.01	11	40	70	.	0	.	1.
1	.01	11	50	71	.	0	.	1.
1	.01	12	00	72	.	0	.	1.
1	.01	12	10	73	.	0	.	1.
1	.01	12	20	74	.	0	.	1.
1	.01	12	30	75	.	0	.	1.

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	12.40	76	.35	.32	.03	115.
1.01	12.50	77	.35	.32	.03	171.
1.01	13.00	78	.35	.32	.03	246.
1.01	13.10	79	.41	.39	.03	316.
1.01	13.20	80	.41	.39	.03	394.
1.01	13.30	81	.41	.39	.03	471.
1.01	13.40	82	.41	.39	.03	545.
1.01	13.50	83	.41	.39	.03	615.
1.01	14.00	84	.41	.39	.03	677.
1.01	14.10	85	.52	.49	.03	731.
1.01	14.20	86	.52	.49	.03	781.
1.01	14.30	87	.52	.49	.03	828.
1.01	14.40	88	.52	.49	.03	875.
1.01	14.50	89	.52	.49	.03	922.
1.01	15.00	90	.52	.49	.03	969.
1.01	15.10	91	.47	.45	.03	1015.
1.01	15.20	92	.79	.76	.03	1062.
1.01	15.30	93	1.42	1.39	.03	1109.
1.01	15.40	94	3.54	3.52	.03	1208.
1.01	15.50	95	1.02	1.00	.03	1366.
1.01	16.00	96	.63	.60	.03	1567.
1.01	16.10	97	.48	.46	.03	1824.
1.01	16.20	98	.48	.46	.03	2088.
1.01	16.30	99	.48	.46	.03	2274.
1.01	16.40	100	.48	.46	.03	2369.
1.01	16.50	101	.48	.46	.03	2374.
1.01	17.00	102	.48	.46	.03	2314.
1.01	17.10	103	.38	.35	.03	2205.
1.01	17.20	104	.38	.35	.03	2062.
1.01	17.30	105	.38	.35	.03	1890.
1.01	17.40	106	.38	.35	.03	1723.
1.01	17.50	107	.38	.35	.03	1589.
1.01	18.00	108	.38	.35	.03	1477.
1.01	18.10	109	.03	.01	.03	1375.
1.01	18.20	110	.03	.01	.03	1283.
1.01	18.30	111	.03	.01	.03	1188.
1.01	18.40	112	.03	.01	.03	1081.
1.01	18.50	113	.03	.01	.03	967.
1.01	19.00	114	.03	.01	.03	849.
1.01	19.10	115	.03	.01	.03	731.
1.01	19.20	116	.03	.01	.03	613.
1.01	19.30	117	.03	.01	.03	517.
1.01	19.40	118	.03	.01	.03	426.
1.01	19.50	119	.03	.01	.03	348.
1.01	20.00	120	.03	.01	.03	284.
1.01	20.10	121	.03	.01	.03	234.
1.01	20.20	122	.03	.01	.03	194.
1.01	20.30	123	.03	.01	.03	162.
1.01	20.40	124	.03	.01	.03	136.
1.01	20.50	125	.03	.01	.03	117.
1.01	21.00	126	.03	.01	.03	106.
1.01	21.10	127	.03	.01	.03	95.
1.01	21.20	128	.03	.01	.03	85.
1.01	21.30	129	.03	.01	.03	79.
1.01	21.40	130	.03	.01	.03	71.
1.01	21.50	131	.03	.01	.03	63.
1.01	22.00	132	.03	.01	.03	57.
1.01	22.10	133	.03	.01	.03	51.
1.01	22.20	134	.03	.01	.03	48.
1.01	22.30	135	.03	.01	.03	44.
1.01	22.40	136	.03	.01	.03	41.
1.01	22.50	137	.03	.01	.03	39.
1.01	23.00	138	.03	.01	.03	36.
1.01	23.10	139	.03	.01	.03	34.
1.01	23.20	140	.03	.01	.03	31.
1.01	23.30	141	.03	.01	.03	29.
1.01	23.40	142	.03	.01	.03	27.
1.01	23.50	143	.03	.01	.03	25.
1.02	0.00	144	.03	.01	.03	22.
1.02	.10	145	0.00	0.00	0.00	21.
1.02	.20	146	0.00	0.00	0.00	
1.02	.30	147	0.00	0.00	0.00	
1.02	.40	148	0.00	0.00	0.00	
1.02	.50	149	0.00	0.00	0.00	
1.02	1.00	150	0.00	0.00	0.00	

SUM 24.24 20.46 3.78 52586.
(616.) (520.) (96.) (1489.07)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2374.	1306.	365.	351.	52581.
CMS	67.	37.	10.	10.	1489.
INCHES		18.41	20.58	20.59	20.59
MM		467.63	522.86	522.88	522.88
AC-FT		648.	724.	724.	724.
THOUS CU M		799.	893.	893.	893.

HYDROGRAPH AT STA LAKE FOR PLAN 1, RTIO 1

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1187.	653.	183.	175.	26290.
CMS	34.	18.	5.	5.	744.
INCHES		9.21	10.29	10.29	10.29
MM		233.51	261.44	261.44	261.44
AC-FT		324.	362.	362.	362.
THOUS CU M		399.	447.	447.	447.

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[illegible]

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL	VOLUME
110.4	61.5	181.5	14.5	266.7	738.
31.	8.64	10.22	10.22	25.9	22
	21.9	25.9	35.4	359.	3
	304.	375.	44.3	443.	3

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RATIO OF PMF	ELEVATION STORAGE OUTFLOW	INITIAL VALUE 216.33	SPILLWAY CREST 216.33	TOP OF DAM 224.20	DURATION OVER TOP HOURS	MAXIMUM OUTFLOW CFS	MAXIMUM STORAGE AC-FT	MAXIMUM DEPTH OVER DAM	MAXIMUM RESERVOIR ELEV	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
50	222.96	0.00	94.	1104.	0.00	17.17	0.00	0.00	0.00	17.17	0.00
40	222.45	0.00	87.	894.	0.00	17.17	0.00	0.00	0.00	17.17	0.00
30	221.92	0.00	79.	662.	0.00	17.17	0.00	0.00	0.00	17.17	0.00
20	221.62	0.00	71.	371.	0.00	17.53	0.00	0.00	0.00	17.53	0.00
10	218.68	0.00	50.	177.	0.00	17.67	0.00	0.00	0.00	17.67	0.00

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